AGRICULTURAL CHEMICALS

A MONTHLY MAGAZINE FOR MANUFACTURERS, PROCESSORS AND DISTRIBUTORS

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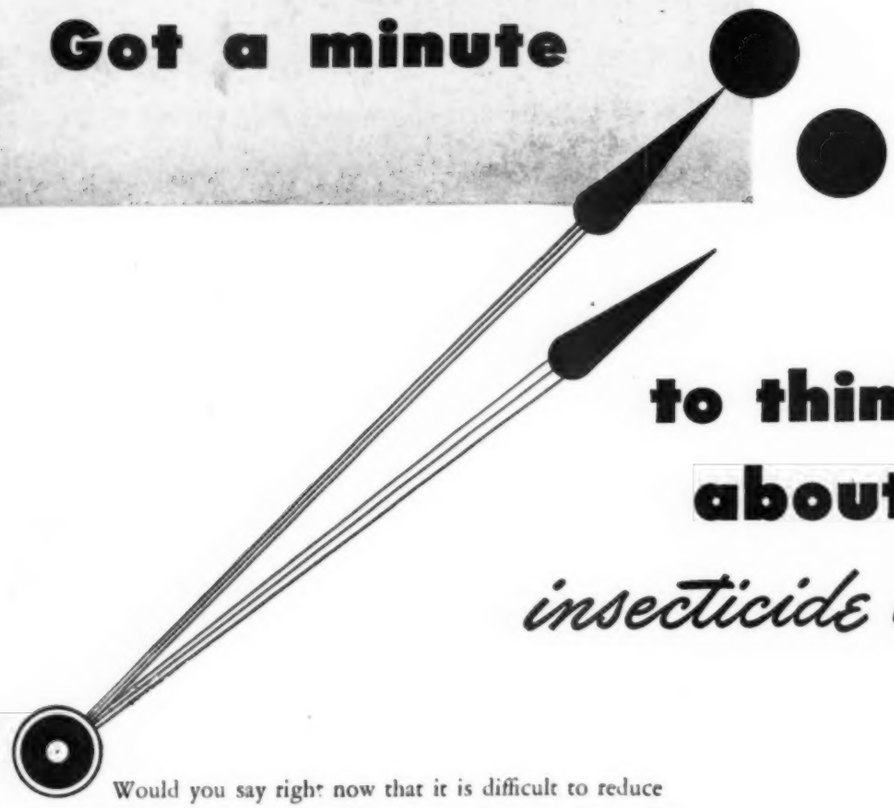

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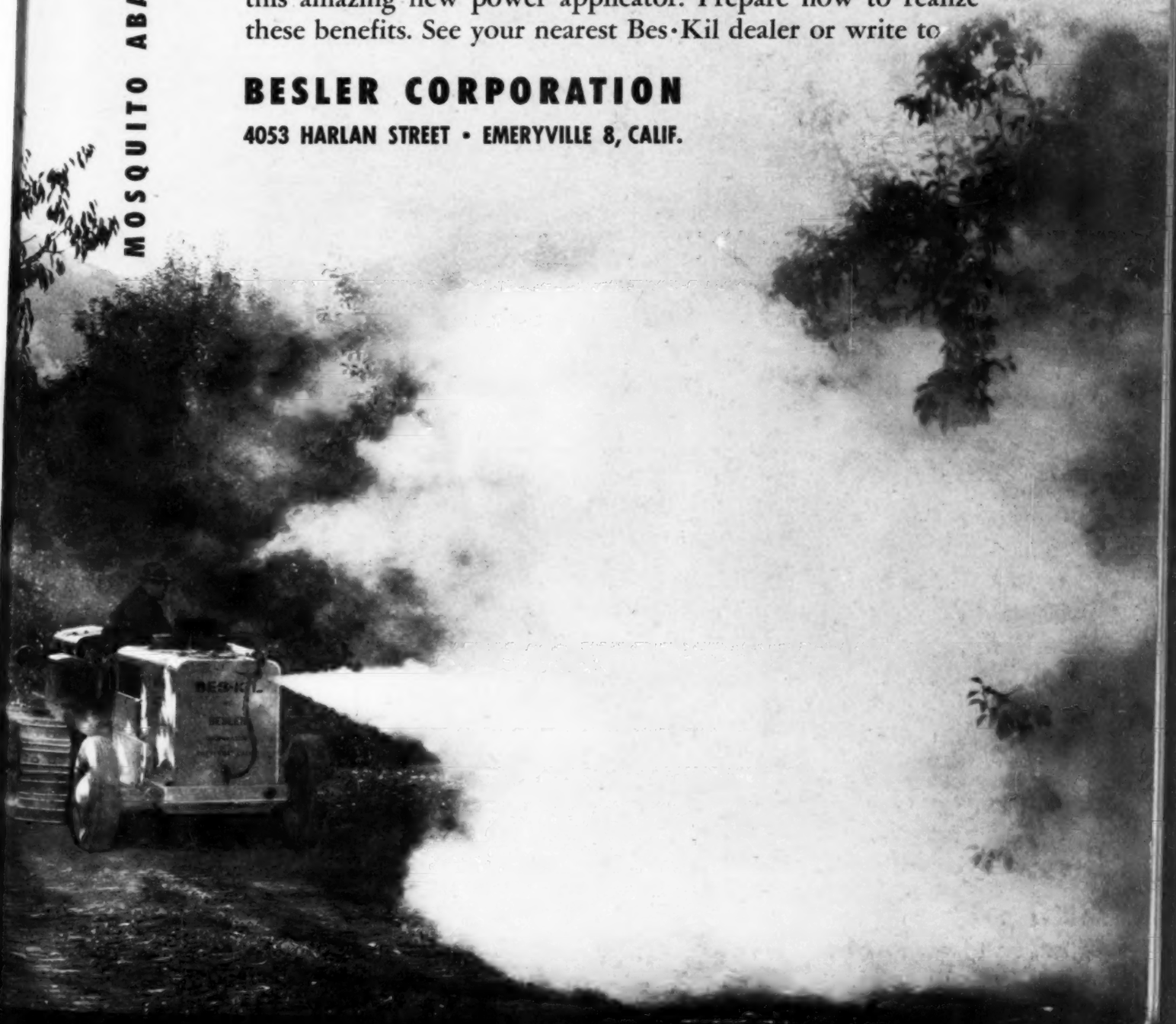

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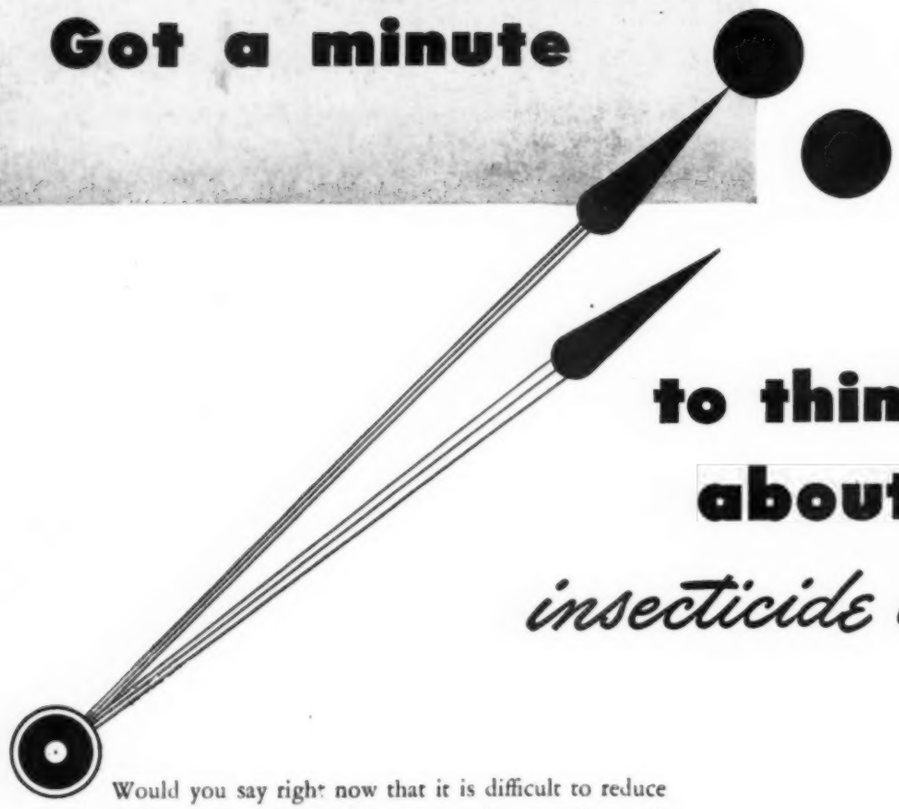

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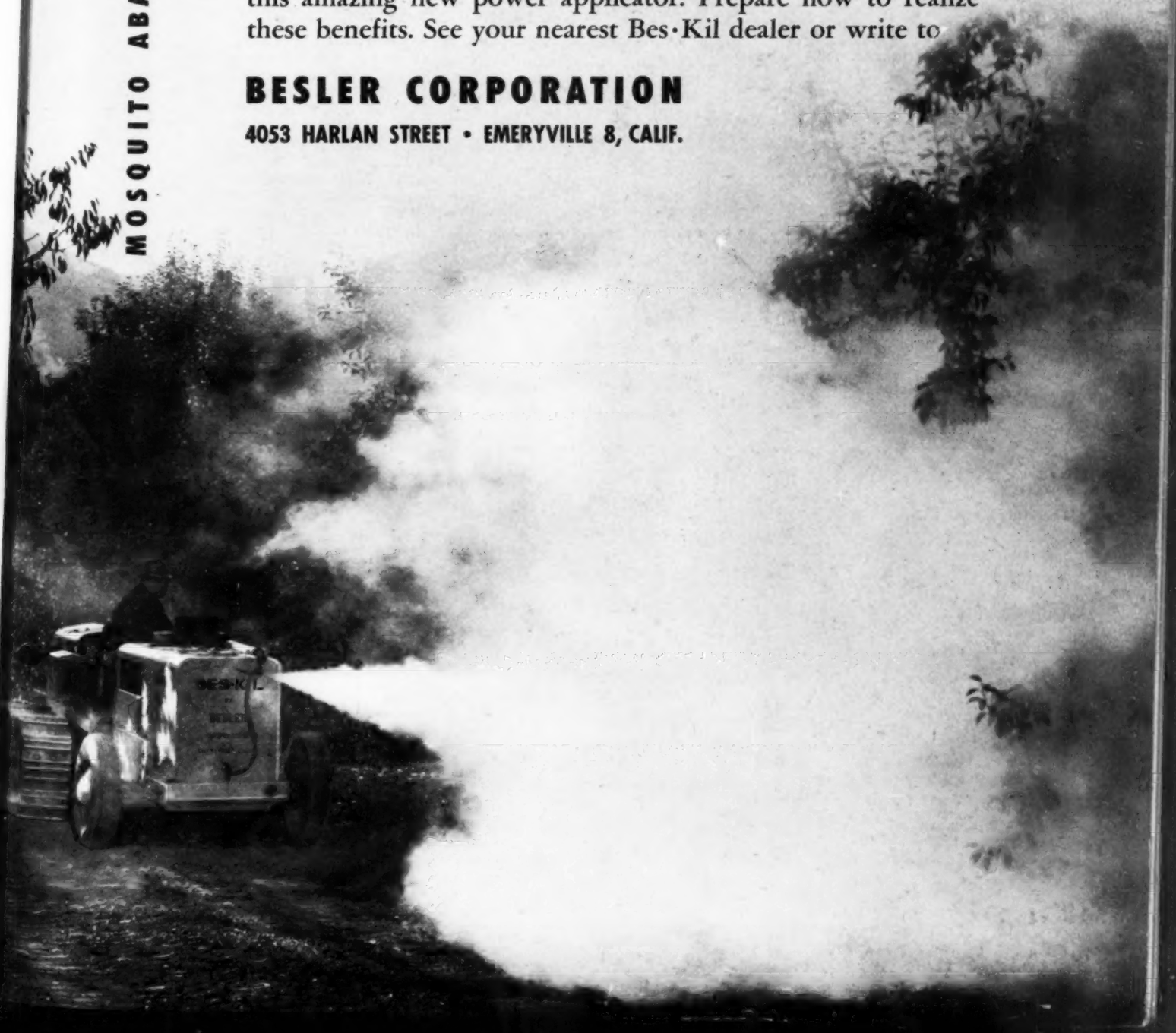

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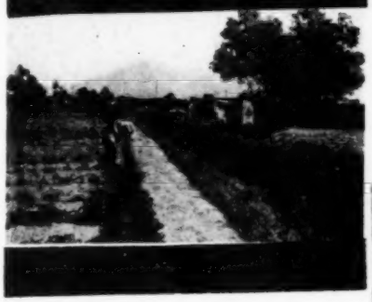

A Monthly Magazine For the Trade

THIS MONTH'S COVER

Italian farmer irrigates his small acreage to get best possible yield from soil. How Italian agriculture fares in the wake of battle is recounted in article on page 18, this issue. (Photo by Acme Service.)

JANUARY, 1947
Vol. II No. 1

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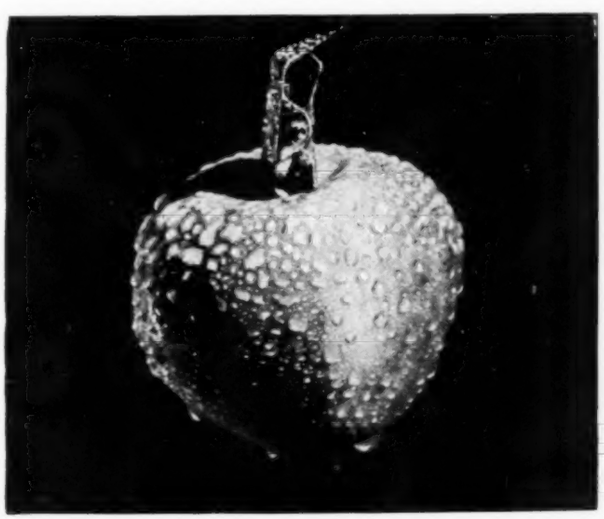

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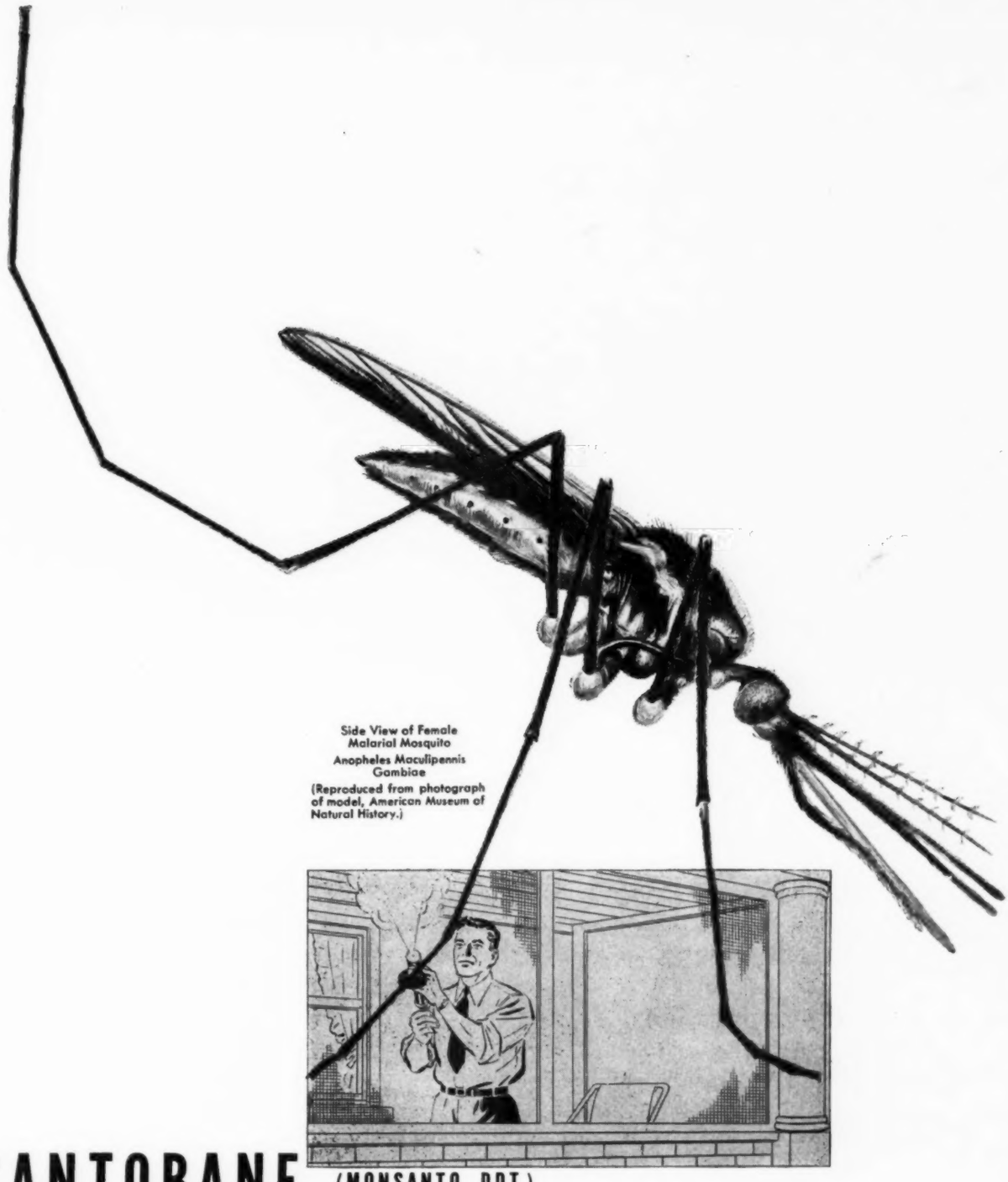

Side View of Female
Malarial Mosquito
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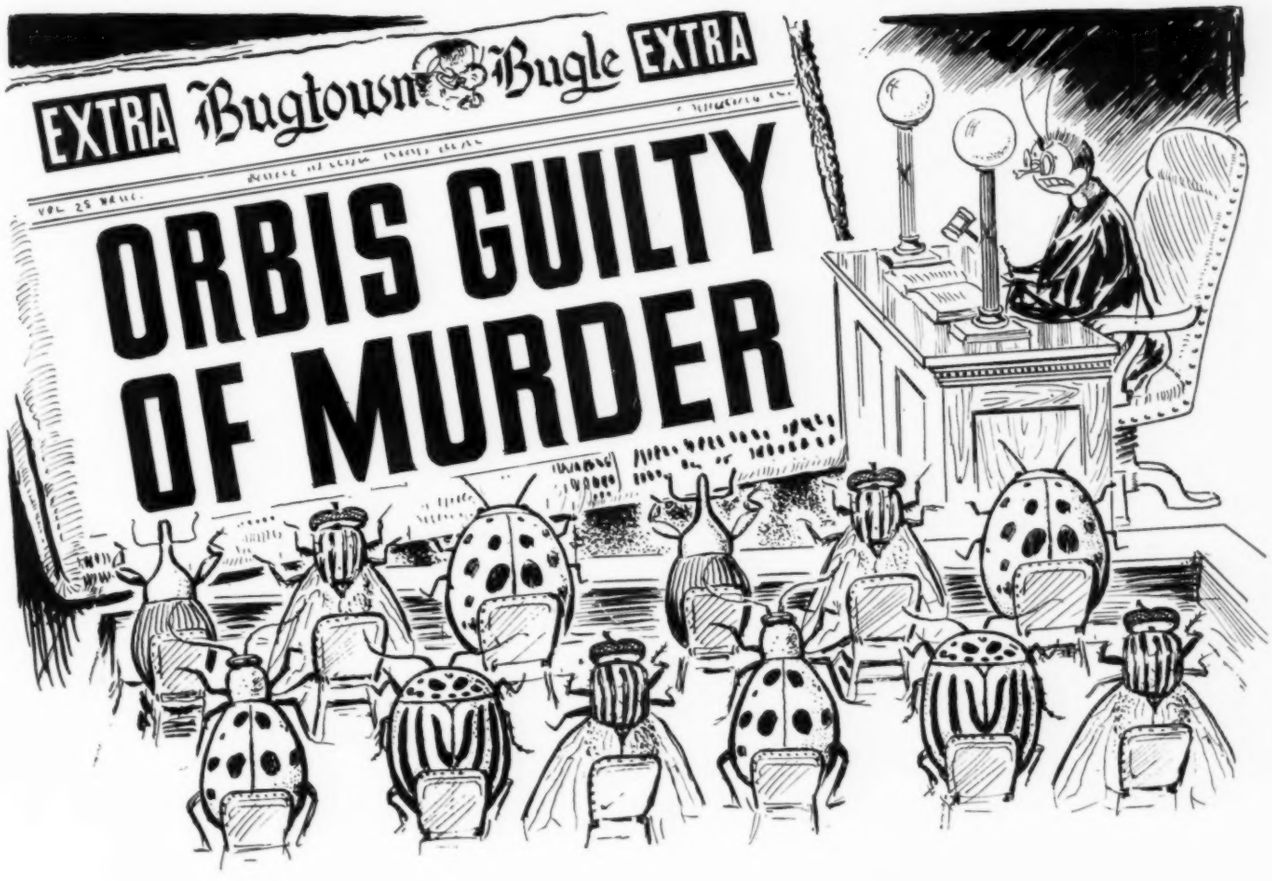

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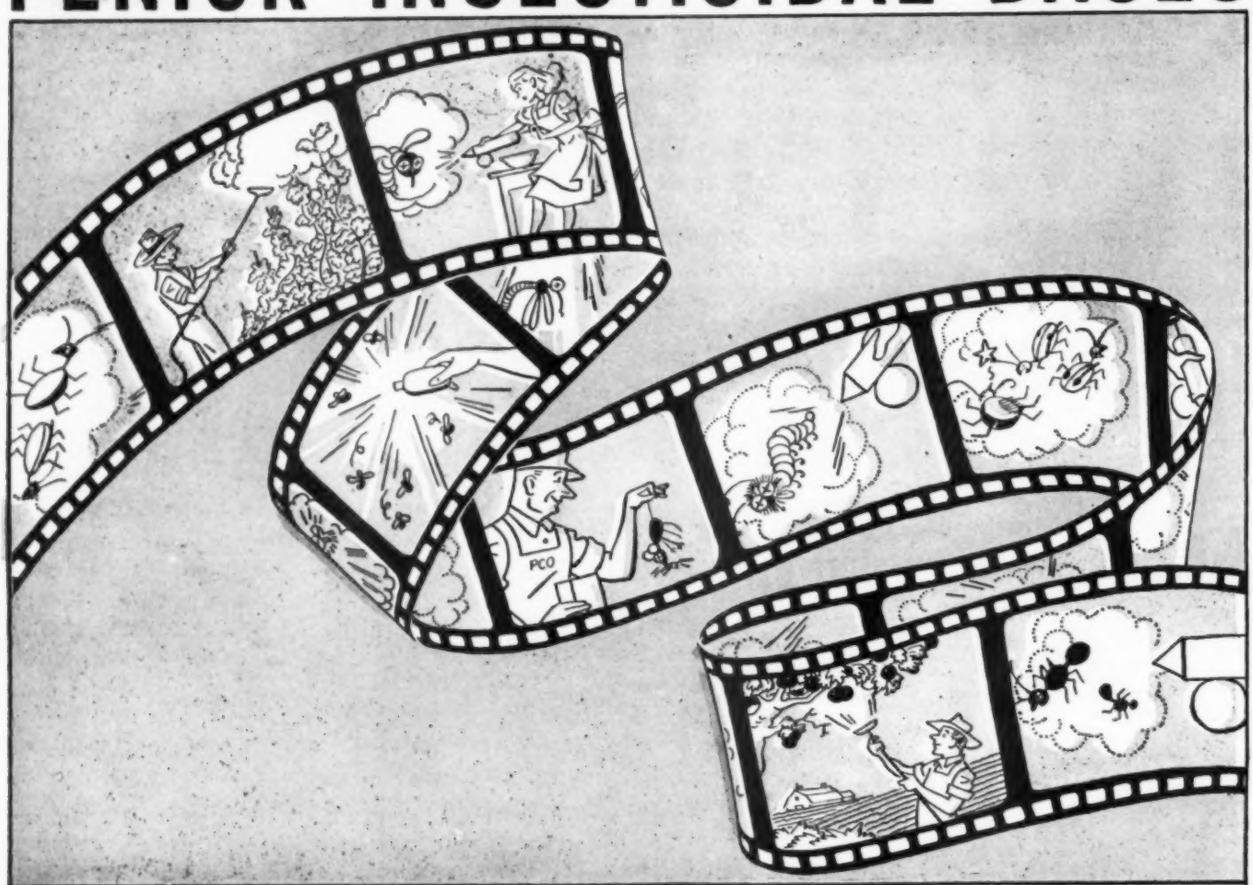

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THE EDITOR COMMENTS

AS we begin Volume Two of *Agricultural Chemicals* and look back over the eight issues since its beginning last May, we feel that an expression of gratitude to our many friends throughout the field is in order. The cooperation and support which this new publication has received from industry, government officials, experiment stations, scientific leaders, and other in and close to the field has been unprecedented in our observations of twenty-five years. With their help, and the close counsel of the members of our Editorial Advisory Board, we have done a lot better job than we thought we could a year ago.

Today, we are even more strongly convinced than we were last year of the continued need and place for a practical over-all business magazine for the field of agricultural chemicals. And with the help of our many able supporters, a bigger and better *Agricultural Chemicals* is the promise for the future.

WITH international air traffic increasing almost daily, and planes arriving in the United States from all parts of the world, the problem of unwanted insect infestations becomes more and more serious.

The need for international cooperation among quarantine officials of all nations is urgent to halt the introduction of unwelcome insects into areas where they were hitherto unknown. Sad is the memory of past experience with foreign insects such as the Japanese beetle, European corn borer, gypsy moth, Oriental fruit moth, Mexican bean beetle, boll weevil, and white-fringed beetles.

Potentially, current air travel presents the greatest problem ever to face the economic entomologist. Unsolved at its source, it can grow to menacing proportions, and become a wave to engulf his efforts or render puny those of the supplier of insecticides to stem the tide.

ALTHOUGH wholly unofficial, we have it over the grapevine that various commercial interests and the Department of Agriculture are close to accord on a new federal insecticide and fungicide law after two years of battling behind the scenes. Rumor has it that Congressman August H. Andresen of Minnesota, influential member of the House Agricultural Committee and long a champion of the American farmer, will shortly introduce the bill. This would seem to make accord unanimous. Its passage by Congress would be an important step toward clearing up the present muddled insecticide legislative situation the country over.

We have been told that the new proposed law is a good law, a strong law. So far, so good. But what about its enforcement? Will Congress, as in the past, expect the Department of Agriculture to make and keep the law effective with a small fraction of the funds, inspectors and other personnel actually needed for proper enforcement? Will Congress pass this good law, and then practically nullify it by skimpy provisions for its enforcement?

Men and money are needed properly to enforce any law. Enforcement of this new proposed law on an equitable basis is important to the industry and agriculture. If the enforcement staff is not expanded to make the law genuinely effective, to knock out the fly-by-night products, then we might just as well struggle along with the antiquated Insecticide Act of 1910. The enforcement staff today is woefully undermanned through lack of funds. With their skeleton staff, they have done a good job, but the job has become just too big. We sincerely hope that Mr. Andresen will drive this point home in Congress.

Guest Editorial written especially for this issue of Agricultural Chemicals.

Agricultural Production — Result of Working, Planning

By Dr. A. M. Boyce
University of California, Berkeley

ANYONE traveling about the country with an alert eye and active mind can scarcely be unaware as he journeys hundreds of miles through the world's finest agricultural regions, that prodigious amounts of time, energy, money and materials are required to keep in production all these millions of acres of land. He realizes that America's leadership in agriculture does not result entirely from a bountiful natural inheritance of fertility and almost illimitable acreage, although nature should by no means be discredited. The trained observer knows that it is the total effort of hundreds of earnest, tireless scientists in federal and state experiment stations, colleges, and universities, and in commercial pursuits which provide the "know how" to make America's agricultural vastness produce crops in keeping with what should rightfully be expected of such an outlay.

A tremendous responsibility rests upon the chemists and other specialists, manufacturers, mixers, blenders, and all others connected with the task of providing the farmer with chemical tools of his trade. There is an educational job to be done, in order that the ultimate consumer may be instructed in proper usage and may have an understanding of the nature of the material he uses. A wide chasm sometimes exists between the knowledge of the maker and that of the consumer. Occasional tragic happenings result from a lack of understanding on the part of the final users, and such mistakes can nullify his work of an entire season.

Many thousands of insect pests are to be encountered in the total scope of agriculture. As has been pointed out on numerous previous occasions, there is no one "super" insecticide which controls them all. A material that is highly toxic for one insect may be almost useless against another. New types of control chemicals are being announced and put on the market in a continual procession. The pace is so swift that relatively few of the dealers and others in the long chain of handlers from manufacturer to user, have very much opportunity to learn of them in a thorough manner. This sometimes results in confusion, misunderstanding, and perhaps mistakes which place on an innocent preparation a stigma which may never be wholly lived down in certain farm-

(*Turn to Page* 60)

Basic facts about

Benzene Hexachloride

By H. L. Haller and C. V. Bowen

Bureau of Entomology and Plant Quarantine
United States Department of Agriculture
Beltsville, Maryland

THE outstanding insecticidal property of benzene hexachloride also called hexachlorocyclohexane, seems to have been discovered independently and almost simultaneously in England and in France during the recent war, at a time when communication between the two countries was not possible.

Raucourt (*14*) states that in 1941, Dupire in France found benzene hexachloride toxic to clothes moths, and as a result submitted the material for evaluation against agricultural insect pests. According to Slade (*16*), the discovery in England was made early in 1942, but war restrictions prevented public announcement.

The earliest published report concerns the French product, the introduction and application of which were discussed by Dupire and Raucourt (*5*) in November 1943. This report and subsequent ones (*4*) by the French workers did not reach this country until early in 1946. The public announcement of the discovery in England made by Slade (*16*) in March 1945 in the course of delivering the Hurter lecture, called attention to the gamma isomer as being the toxic constituent. The experiments of Lormand reported in May 1945 by Raucourt and Viel (*15*) in France were in agreement with this.

Shortly after Slade's lecture, extensive investigations of benzene hexachloride were initiated in the United States. The first preparations that were tested were made from technical grades of products obtained from England. All of them had a disagreeable pungent odor. The gamma isomer content of different preparations ranged from 10 to 35%, and was determined biologically. At that time no precise chemical or physical methods of analysis were available. As benzene hexachloride is easily prepared from chlorine and benzene, both of which normally are readily available, several American chemical companies soon undertook its manufacture, and today about a dozen companies are known to be producing it.

Benzene hexachloride was first prepared from benzene and chlorine by Faraday (*6*) in 1825. The proper systematic chemical name is 1,2,3,4,-5,6-hexachlorocyclohexane, in which the numbering refers to the location of the chlorine atoms in the molecule, i.e., one attached to each carbon atom. When the prefixed numbers are dropped and the name hexachlorocyclohexane is used alone, the name is no longer representative of this compound but may also refer to hexachloro-substituted-cyclohexanes which have 2 chlorine atoms attached to some carbon atoms and none to others.

The name benzene hexachloride has been confused at times with hexachlorobenzene. The former has the molecular formula $C_6H_6Cl_6$; the latter has the formula C_6Cl_6 and is insecticidally inert. Although both products are obtained from benzene and chlorine, benzene hexachloride is an addition product of benzene and chlorine, benzene hexachloride is an addition product of benzene and chlorine while hexachlorobenzene is a substituted benzene. Chemically, benzene hexachloride is a chloride-substituted cycloaliphatic derivative and hexachlorobenzene is a chlorine-substituted aromatic compound. Depending upon factors such as light, heat, catalysts, and the like, the reaction between benzene and chlorine may take one of two courses. In the presence of catalysts, such as iron, iodine, ferric chloride, or aluminum chloride, chlorine may replace one or more hydrogen atoms of the benzene ring with the formation of monochlorobenzene, dichlorobenzene, and, finally when all the hydrogens have been replaced, hexachlorobenzene.

Of these derivatives the ortho- and para-dichlorobenzenes are of greatest interest in economic entomology, the former being useful in the control of fly larvae, and the latter, because of its value for peach borer control, and its extensive use as a household fumigant.

The other possible reaction between benzene and chlorine is the addition of chlorine to the double bonds of the benzene ring in the presence of actinic light to form benzene hexachlorides. Unlike the replacement or substitution reaction, it has not yet been possible to add chlorine to the three double bonds step-wise, that is, with the formation of dichloro or tetrachloro derivatives. Under all conditions so far tried, the

final product is benzene hexachloride. The reactants are required in the ratio of 3 moles of chlorine to 1 mole of benzene. When the ratio is other than 3 to 1, the final product is a mixture of unchanged benzene and benzene hexachloride. An extensive study of the reaction product by van der Linden (*13*) showed it to consist of four isomers. Recently Kauer et al. (*10*) have described a fifth form, which they have designated as the epsilon isomer. Patents describing its production have been issued to Harry Bender (*1*) in 1935, H. P. Stephenson and A. L. Curtis (*17*) in 1936, A. E. Grant (*7*) in 1939, and Thomas Hardie (*9*) in 1940.

As the chlorine atoms can add to the double bonds of the benzene molecule in one of several ways, the reaction product consists of a mixture of benzene hexachlorides. So far, five different or isomeric benzene hexachlorides have been isolated by fractional crystallization of the reaction product from organic solvents. These have been designated as alpha, beta, gamma, delta, and epsilon isomers. Their alphabetical designations indicate the order in which they have been discovered and described in the literature, and bear no relation to their relative structures. According to Slade (*16*), J. C. Smart of Imperial Chemicals Industries found the gamma isomer to be formed to the extent of 10-12 percent in the treatment of benzene with chlorine in the presence of light. Gunther (*8*) has recently reported that a product having 42 percent of the gamma isomer is obtained by the treatment of benzene with chlorine in the presence of actinic light and a dilute aqueous sodium hydroxide solution. The remainder of the product is comprised of the other isomers and small amounts (1-4 percent) of other higher chlorinated cyclohexanes.

Odor a Handicap

THE unpurified reaction product possesses a disagreeable persistent odor, and usually an attempt is made to remove it before converting the product into insecticidal preparations. The commercial methods of accomplishing the removal of the odor have not been published, but probably consist of treating solutions of the crude product in organic solvents with deodorizing adsorbent materials. The solubility of the several isomers varies considerably in organic solvents, the beta and the alpha being less soluble in most solvents than the gamma, delta, and epsilon isomers. Therefore, the proportion of the several isomers in the deodorized product may be different in technical deodorized products obtained from different sources. Deodorized benzene hexachloride having approximately 20 percent of gamma isomer content is available from several manufacturers, the remainder being a mixture of the other isomers. Products having a higher gamma isomer content are also available, as are limited quantities of a technical grade of gamma isomer of about 95 percent purity. All the grades of benzene hexachloride can be made into suitable dusts, water-dispersible powders, and emulsions with the same diluments, wetters, and spreaders used for other organic insecticides.

Because of the lack of suitable methods for evaluating the gamma isomer content, difficulties were encountered at the outset in the preparation of insecticidal dusts. The use of physical methods, such as infra-red spectrometry, makes it possible now to standardize these preparations.

Because the commercial benzene hexachloride is a mixture of isomers, it does not have a sharp melting point, but melts over a range of temperature. This range may vary, as it depends upon the proportion of the several isomers present. The melting point of the pure isomers is as follows:

Isomer	Melting Point C.
Alpha	157.5-158
Beta	309.
Gamma	112.5
Delta	138-139
Epsilon	218.5-219.3

Unlike DDT, benzene hexachloride does not appear to lose hydrogen chloride when heated with traces of metals or their salts, such as iron and aluminum or their chlorides, below 115° C. This applies to the technical benzene hexachloride as well as to the individual isomers. On the other hand, benzene hexachloride is more volatile than DDT and sublimes rather easily. This may account for the fact that its residual action is of shorter duration than that of DDT. With alcoholic alkali, benzene hexachloride splits out three moles of hydrogen chloride to form a mixture of isomeric trichlorobenzenes. DDT under the same conditions gives but one mole of hydrogen chloride to form a substituted ethylene.

The formation of a number of different benzene hexachlorides can be accounted for in the following manner. If the assumption is made that all the carbon atoms of a saturated benzene ring or, more properly designated, the cyclohexane ring, lie

in one plane, then one of the remaining two valances of each carbon atom is directed above the plane and the other below. It is thus theoretically possible to have a benzene hexachloride in which all the chlorine atoms are above the plane and all the hydrogen atoms below the plane. This would be an instance in which five chlorine atoms are above and one below, three with four chlorine atoms above and two below, and three with three above and three below, making a total of eight compounds or isomers.

The technical benzene hexachloride preparations obtained from England were designated as "666." This number was probably derived from the molecular formula of benzene hexachloride, $C_6H_6Cl_6$. Because 666 is also the designation of a medicinal product used in this country, it would appear desirable not to use this number for the insecticide. The term "gammexane" was proposed by English workers for the gamma isomer of benzene hexachloride, but unfortunately it has also been applied to technical preparations of benzene hexachloride.

Toxicity Not Determined

THE toxicity of benzene hexachloride to higher animals is not yet known with accuracy, although reports indicate that the gamma is the most toxic of the several isomers. Oral administration of this isomer to rats showed it to be about six times as toxic as a mixture of the isomers (containing 10-12 percent of gamma isomer). Doses greater than 1-1.25 grams of the technical product per kilogram of body weight of rats have been reported by several investigators as having lethal effects. Apparently no deleterious effects were seen in rabbits which had been exposed to benzene hexachloride vapors in a confined space for 1 hour daily over a period of from 3 to 6 months (*12*). A 3-percent dust mixture (*12*) applied to a rabbit's eyes and nose did not appear to cause either local irritation of the nasal mucous membrane or lachrymation. However, reports have been received that benzene hexachloride when used as a dust in field applications has caused nausea, headache, and irritation of the skin, eyes, nose, and throat of some of the people exposed to it. An instance has been cited where workmen refused to apply dusts containing benzene hexachloride.

Some of the progress that has been made in the entomological evaluation of benzene hexachloride in the United States during the past year and a half has recently been summarized by Bishopp in *Agricultural Chemicals* (2) and elsewhere (3). Although much testing has been carried out, the accurate evaluation of the technical product has been hampered by a lack of methods and apparatus for determining the percentages of the several isomers of which it is composed. Absorption spectra in the infra red are being used especially for the determination of the gamma isomer. Highly specialized equipment not readily available and a specially trained operator are needed for this method. So far, no chemical reaction has been discovered which permits the identification of the gamma isomer in the presence of the others.

Recently it has been shown (*11*) that the gamma isomer inhibits the growth of a strain of yeast, a characteristic not shown by the other isomers. It may be possible to make use of this observation for assay purposes.

The fact that benzene hexachloride like DDT, TDE (1, 1-dichloro-2, 2-bis(p-chlorophenyl)ethane), Velsicol "1068," and Hercules "3956," liberates hydrogen chloride in the presence of alkali, presents an even greater challenge to both the chemist and the entomologist to develop methods for the assay of the individual components of insecticidal preparations.★★

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Agriculture in Italy Carries on In the Wake of Battle

IN the "Combat Area" that was Italy during 1943, '44, and '45, strangely enough, chemicals for agriculture were very important throughout the period of military operations—far removed from actual operations, yet an inherent part of the military campaign. The job was not only to keep 45 million people fed and out of the way of the Armies, but at the same time to get for the Armies themselves thousands of tons of otherwise unobtainable foodstuffs: fruits and vegetables, special foods for the hospitals, live sheep and goats for the Mohammedans, timber for construction and fuel, mules and their forage, for the "mud and mules" part of the campaign. All these things represented a big assignment for the "Agriculture" officers, and, in many instances, agricultural chemicals demonstrated their essentiality to the program.

The things that happened "in the wake of battle" were not normal in the true sense of the word, but they were nevertheless fundamental to food production in that country. Gradually the staff (*1*), specialists and farmers from all parts of the world, came to appreciate the situation, and to understand many of the complexities that are normally obscured by "customs." Few of them had ever worked in the area, and, in overcoming the handicaps of unfamiliar language and customs, they learned a great deal from the problems that faced the European chemical industry, and the agriculture it supplies. Since production problems have a way of projecting themselves into the future, many of these problems are of interest today. They will affect the situation for years to come, although this presentation is based only on two of the more troublous years' experiences—the period of Military Government of agriculture and its subsequent transition to civil administration.

Like the three blind men describing the elephant, any limited approach is misleading. Italian agriculture is composed of such extreme variations due to latitudes, elevations, ocean influences, etc., that it is a difficult subject to administer, or even diagnose. Outstanding were factors such as the enormous tonnage of supplies consumed annually in such an intensive agriculture, the amazing momentum of the complex program that is farming, the essentiality of trained and conscientious administrative organization to a coherent program, and finally the futility of short-range programs in agriculture, integrated as it is with all the foregoing factors, and, above all, the weather factor.

Accurate records (*2*) on the annual consumption of agricultural supplies served to diagnose the ailment rather than to indicate any immediate cure. The Italian program, before and during the war, had been naturally based on maximum use of fertilizers and fungicides, and an increasing use of insecticides—to get the desired volume of crop yields. On soils old beyond any American standards, yet often reasonably deep and fertile, the importance of added nutrients, to achieve and maintain a balance, is almost unbelievable. Italy consumes, in normal times, an imposing array of agricultural chemical tonnages. Up to 1½ million tons moved annually by boat from phosphate mines in North Africa, and thousands of tons of copper and other products from mines and factories of Continental Europe by rail and boat. Heavy annual tonnages moved also from factories near the surplus electric power in Northern Provinces, including most of the yearly requirement of 70 thousand tons of actual nitrogen, processed into various forms of fertilizer. Only potash is abundantly available in most soils, excepting those in the rice and tobacco producing districts.

In addition to basic dependence on fertilizers and pesticides, Italian agriculture does not naturally produce a balanced diet for so many people. Still isolated by the continuing war effort, the degree of self-sufficiency which could be maintained in the immediate postwar period was limited by soils overworked for many years in an effort to produce the maximum in balance and volume. At the same time, the materials which were made available returned at least ten or twenty times their weight—because the accumulated deficiencies made the yield proportionately more sensitive to the stimulus of small quantities of the fertilizers and pesticides to which the farmers were accustomed. Resultant crop increases were so outstanding that a dilemma presented itself in the allocation of the limited supply of ocean tonnage—how far to set aside day-to-day relief foodstuff import schedules to include agricultural chemicals with which to produce more locally, in the interest of less "relief" in future months. Since the tonnage was never adequate for both programs, only the chemicals that returned the

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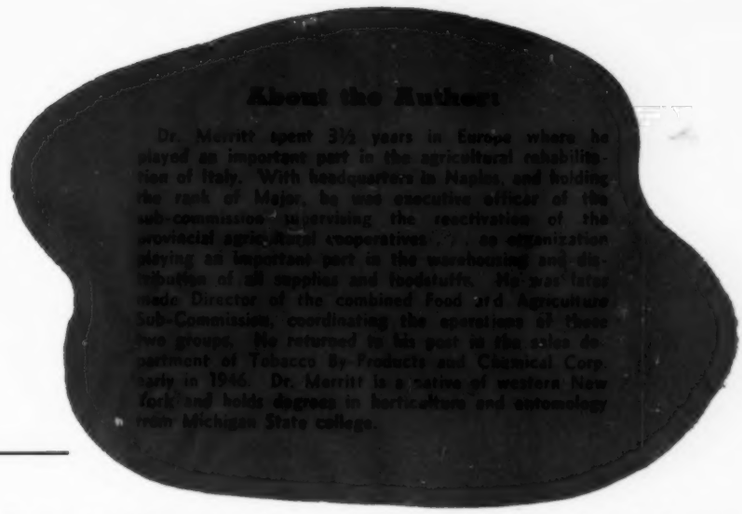


most, and in the shortest time, could be considered.

Production Problems

LONGTIME problems were found in the fertilizer program, even after the expensive rehabilitation of nearly thirty factories. Acid phosphate production is hindered by the losses in coastwise shipping which allowed movement of rock from the shallow harbors of North Africa, and the rehandling of finished fertilizers to coastal areas where the consumption is heaviest. Inherent in the program is the normal movement of surplus pyrites to France, involving mine rehabilitation, coastwise shipping, and exchange valuations which eventually must be reflected in the prices of fertilizer and the crops to which it is applied. In the initial stages, the rate of factory operation first overloaded inland transport and warehouse space, then necessitated costly shutdowns while shipping slowly built up the raw material supply. Naturally, this retarded the uniform and effective rebuilding of soil fertility to levels insuring agricultural production at economical levels.

No less difficult is the future of nitrogen production, despite Italy's very large normal production. One of the largest plants produces calcium cyanimide at Terni, using the surplus hydro-electric power from three 45,000 KW generators—all of which the Germans destroyed by burning the transformers, and setting off demolition bombs on the upper bearing of the generator shafts, but leaving the turbines undamaged. Rebuilding the transformers, and repairing the generators, first one and then a second of the units was put in service, but still they are unable to produce power in excess of the needs of essential industry and lighting required in the interest of employment and public safety.

Fertilizer production requires not only electrical power, but coke from nearby plants that use imported coal in making ammonia. A host of other materials integrated with the chemical and steel plants are dependent on the same source of power. Few plants suffered as much destruction as the TERNI SOC., but all the major nitrogen-producing plants are so closely allied to the whole chemical industry that their fertilizer units cannot respond effectively to the priority needs of agriculture until industrial rehabilitation is well along—or until a degree of normalcy obtains in the whole European coal supply situation. Potentially, thirty percent of nitrogen fertilizer production is independent of coal, after local production power and lighting needs are satisfied. But fertilizer stocks blocked at the factory by wartime road and rail destruction actually contributed more material than new production, up to the end of 1945.

Fungicides Used

SINCE a crop lost by disease is entirely inconsistent with the intensive farming customs in such a food-deficient area, the fungicide usage in Italy is outstanding above all else. The weather varies from season to season, and the usual hot, dry summers are all too often prefaced by late spring rains, or fall rains come too soon. Wheat smut spread through half the country in 1944, and as the harvest reports came in, increasing reports of smut indicated the need of nearly normal transfers of seed grain in most of the Provinces of Central Italy. Seed production is localized, and certain areas ship out most of their wheat crop—hence, despite the overload on transportation, a great deal had to be moved to insure a reasonable planting in primary producing areas. Normally, seed treatments alleviate such an outbreak, but in this instance the available copper fungicides had to be moved from the fruit and vegetable areas. The continuing shortage of materials had left the wheat area completely without fungicides. Again, seed renewal and seed treatment are standard practices, and the movement of several thousand tons of seed, and a few cars of copper sulfate, successfully avoided a reduction in the area planted. However, the development of adequate seed treatment practices, and the distribution of supplies for general use, is one of the major post-war problems.

In the fall of 1944, early rains defoliated the vines in the principal grape-producing areas, just before the critical period for sugar formation. Premature ripening caused heavy losses in the production of wine, in addition to the damage to the vines. Aside from the importance attributed to wine in the Italian diet, the normal exchange of produce from Province to Province was upset, for the cereal areas could not supply the wine areas, and vice versa. The regions specializing in fruits—grapes, peaches, apricots, citrus, etc.,—are so intensively operated that they cannot carry on

their normal economy if crops are lost because of diseases being unchecked. Hence the individual, despite the small size of average holdings, is always prepared to dust, spray, or treat his seed, promptly and heavily. Equipment is outmoded by about 30 years in comparison with most U. S. commercial fruit and vegetable-producing areas, but fairly well adapted to the plantings in Italy. There is ample labor to operate antiquated knapsack sprayers, hence the fungicide consumption is extremely high in wet seasons. Bordeaux mixture is used at 9-9-50, or higher, and no farmer feels secure when an outbreak of disease threatens, unless he knows he can get sulfur, copper sulfate, and even specialized materials, in almost unlimited quantities.

The characteristic disease/control relationship was the basis for heavy demands for imported copper sulfate during the 1944 and 1945 seasons. Military zones are not economic zones, and while the land patterned the indigenous production of food, the normal pattern for supplying the essential chemicals was never available, least of all in the early part of the campaign. In Southern Italy, the demand for copper sulfate was seasonal, but insistent over all else, because previous seasons had drained the countryside dry of that material or any substitute. The most striking gesture in support of the drive for more and more agricultural production, was without doubt the receipt of 12 thousand tons of copper sulfate from Britain in the spring of 1944, an emergency program in view of vegetable and fruit requirements. The British Ministry of Food knew the situation (*3*), and they were largely responsible for a program of shipments that earned the gratitude of the farmers, who knew their unprotected plantings might be totally lost. Within a few days—as soon as special convoys could reach the various Provinces—small copper sulfate stocks were evenly distributed, and light blue crops here and there promptly proved the timeliness of the shipments.

However, as the area under Allied control grew larger, no rehabilitation program could prepare the factories and import the blister copper in time, nor could any relief program encompass the tonnage of copper sulfate required for the 1944-45 and 1945-46 seasons. Italy operates on a level of 80 to 100 thousand tons of copper sulfate consumption, locally produced but wholly dependent on imports of copper. Fortunately in that respect, the continued drought in 1945 retarded the development of diseases generally—but there are many factors that will prevent early achievement of a full program, and will provide ample opportunity for newer fungicides to develop. Small quantities cannot be efficiently spread over the entire area, hence the individual farmer will have to reduce his production for some time to come. This is a matter not too serious to the individual, but damaging to the naturally dominant position of Italian agriculture in supplying the rest of Europe with fresh fruits and vegetables.

With the various blights, blackrot of grapes, and comparable diseases, to contend with, sulfur could not answer all purposes. However, it has long been emphasized, being mined in many areas of Italy, and it proved to be a mainstay in the program when all supplies were scarce. Mines are located in Sicily, Northern Italy, and in the mountains back of Naples. These latter mines, in early 1944, served all of Southern Italy—largely because of the initiative and resourcefulness of one person, Mario Placido. A nearby Province had been refused supplies of Sicilian sulfur, because of the total lack of means to move it from the mines. Placido came to Naples to plead the case—or to get permission for wagons to make the four-day journey to the Avellino mines as an alternative. He found that these mines were operating, but that they had been systematically damaged by the Germans, the railroad destroyed, and their operations confined largely to supply a few black market operators. He then arose to the greater task of supplying all the Provinces of Southern Italy. With the few trucks that could be assigned more or less continuously, he loaded rail cars at two army railheads, each about fifteen miles away—fulfilling a rail program for six or eight weeks to the entire satisfaction of the army personnel in charge of both these "active" points not far back of Cassino, on the Naples-Foggia lines. That in itself was a real accomplishment for an Italian civilian; but in addition, he loaded convoys of army trucks at all hours, as they arrived by arrangement with the Provincial AMG officers, to pick up a "return load." The mine operators co-operated fully, and many additional persons were helpful in the movement of some twenty or thirty thousand tons of sulfur; but it was the vigilance and leadership of Placido that kept operations moving at such high-speed.

Incidentally, the writer located the mines on an early survey trip, and went over the damage with the owner. We found the dam dynamited but repaired to catch a little of the winter's rain, the standby Diesels destroyed, and the railroad bridges down in the rivers. The highway through the mountains was almost impassable, for the curves had been straightened last by the tanks in the battle for Benevento. We actually drove down the steps in the streets of one little village to reach the mines, an event which created an appreciable respect for the work of the Provincial AMG officers, the operators, and Placido and his group. It illustrated the importance of leadership and initiative.

The overall situation on sulfur developed rather satisfactorily, for it eventually flowed out of the various producing areas by a sort of mutual effort, as the transportation system was rebuilt. Generally speaking, the aggressive growers found their way to the sulfur mines, just as they handled their needs of other materials. However, the normal level of consumption, around 100 thousand tons a year, is dependent upon efficient rail transportation and coal, some imported pitprops, and even more complex factors such as the sulfur needs of the soapmaking and synthetic fibre industries.

The tonnage of insecticides consumed annually is in sharp contrast to the volume of fertilizers and fungicides. Basically this is linked with the long-time emphasis on quantity versus quality, but it is certainly also linked with cultural controls

such as clean cultivation and intensive rotations. Many pests which would otherwise destroy the crop have been held to low levels by practices such as weeding wheat and hemp, and intercropping orchards with vegetables or cereal crops. Interesting in this connection is the fact that the yield from intercropped acres is largely responsible for the great fluctuations in production—for if the moisture is adequate the cereals are harvested and threshed; if not, they are grazed to compensate for the loss of permanent pastures in such dry seasons. In any event, the absence of plants which could act as alternate hosts for insect pests is a conspicuous factor in holding down infestations. Likewise, the succession of different crops that occupy the land in the major vegetable areas, each intensively tended, seems to hinder many insects. For instance, the Naples area is famous for the poplar trees, planted in squares forty feet or more apart—between which are strung the wires that support grape vines, some twenty feet in the air. Underneath, the irrigated soil annually carries successive crops of hemp, late summer corn, then wheat or cauliflower during the winter—rotations probably developed over a long period as being a reasonably effective means of avoiding losses from insects.

Hence the annual consumption of the various types of arsenicals is only around seven hundred tons—mostly lead and calcium arsenate, but considerable amounts of paris green, and some arsenites for grasshopper and mole-cricket baits. Lesser quantities of the various other types of insecticides are used, including quassia wood, nicotine, rotenone, pyrethrum, tar oils, and special citrus materials like cyanides and oils. Only nicotine and pyrethrum are produced locally—although several others are blended and packaged after they are imported. In general, formulation, packaging, and distribution methods are inadequate for the best use of such materials—and standards are often too lax to protect the interest of the user.

The consumption of insecticides has doubled in the last ten years, yet due to the dominant position of a few suppliers and inattention to the rest, no comparable improvement in preparation and use of insecticides has developed. The situation is beginning to correct itself, as leaders in both manufacturing and agricultural fields are necessarily striving to improve the usefulness of materials at hand, and to obtain more useful controls for the future—definitely a long-time program.

Locust Problems

HOWEVER, when cultural or biological controls fail to prevent an outbreak actually threatening the volume of yield, the farmers again cooperate in the use of insecticides, on a scale fully equal to U. S. standards. For instance, mountainous areas of two Provinces in Sardinia harbor locusts, as do a few smaller areas elsewhere. The infestation increased during the drought of 1945, spreading over most of those Provinces, because, while there is an Experiment Station there, the impracticability of a normal operation, due to the absence of bran, sawdust, transport, etc., had prevented the timely application of baits back in the breeding areas. As the drought continued, a proportionately larger program was demanded for 1946, and the availability of forty-five tons of imported white arsenic was almost overlooked in the scramble for flamethrowers and other headline methods of attack. The officials, and the farmers, demanded an all-out campaign—although the effective control will continue to be the regular "baiting" system that operates in normal times. In that connection, fears of locust outbreaks are well-founded there, for the high, almost inaccessible mountain pastures in which the pest perpetuates itself are within easy reach of the wheat fields in the plains. Whenever the locust population requires more food, their first migration is to the wheat. A considerable part of the small Sardinian crop was taken in 1945. Only the Southern Province, remote from the breeding areas, suffered little damage. In the other areas the damage was so great that the stubble could not provide adequate pasture for the sheep until the rains brought other pasture, and they went into the winter severely weakened.

Hence, the esentiality of insecticides in Italy is still largely a matter of whether or not the crop will be lost, rather than a balancing of the cost of control measures against regular gains in volume and quality. However, the trend is increasingly toward the preservation of quality, especially by the growers and shippers who normally supply the markets of the Continent with fruits and vegetables. These moved with commendable speed in pre-war times, even to London markets, and the packaging methods and equipment were good—some shippers had very elaborate packs of peaches and citrus fruit. In this trend the citrus industry has been a consistent leader, with its own pest control organization established in Sicily. The heavy losses suffered during the war years limited their markets and makes their problem greater than ever. Much acreage was neglected for two seasons, because surpluses were inevitable, and imported supplies were unwarranted until the plantings themselves were in danger. Finally the growers received about 200 tons of oil with which to supplement their local supplies of sulfur—but tentage for fumigation will have to be renewed before a full program of pest control is achieved.

Agriculture in Italy must be credited with maintaining its momentum throughout the difficult years. Forty-seven percent of the people are tied to the land in some way, and agriculture never stopped for the war. It was a refuge, a source of money and food, and in very few instances did combat operations halt operations completely. Front-line observers (*4*) always found someone who knew where the rest were—ready to return to their work as soon as the battle had passed. When the battle was static, farmers were seen plowing while the shells whistled overhead, and they passed through the lines to attend AMG meetings, in a few instances. The shepherds on the Anzio beachhead stayed with their flocks, sending out a call for shears when shearing time came—and their flocks were still grazing the parts too heavily mined for plowing, in the fall of 1945. No area of comparable

(*Turn to Page* 41)

Resumé of DDT for Agriculture

By Dr. Alvin J. Cox

IN the early part of the last century when little attention was paid to personal cleanliness, infestation with lice was generally believed to be a sign of good health, for these insects were thought to extract the impure juices of man's body. Plant lice belong to the same order of hemipterous insects. On the backs of all of them may be seen two honey tubes or warts from which issues a sweet substance very much liked by ants, accounting for the friendly and intimate terms between them. In the early part of the 18th century, Dr. Harris of Cambridge, Mass., mentioning them in his "Report on the Insects of Massachusetts Injurious to Vegetation" says: "The best application for the destruction of plant lice is a wash made of two parts of soft soap and eight of water, with which is to be mixed lime enough to bring it to the consistency of thick whitewash. This is to be put upon the trunks and limbs of the trees with a brush and as high as practical, so as to cover the whole surface and fill all the cracks in the bark. The proper time for washing over the trees is in the early part of June, when the insects are young and tender." This indicates one of the first insecticides, incidentally still being used, and shows the brush as the predecessor of the spray rig.

For several hundred years pyrethrum flowers, which are of the genus *Chrysanthemum* and resemble an ordinary field daisy, have been used in a limited way for the destruction of household insects. This genus contains more than 100 species but the U. S. Dept. of Agriculture recognizes only 3 as being suitable for the manufacture of insect powder. *Pyrethrum cinerariaefolium* is the only species that is commercially important and it has as an active principle pyrethrins I and II. It kills insects such as caterpillars, grain weevils, flies, mosquitoes, crickets and certain aphids when it comes in contact with the surface of their bodies. The other famous vegetable insecticide is derris, the outstanding active principle of which is rotenone. There were also developed nicotine, paradichlorobenzene, hydrogen cyanide, petroleum oil, various organic thiocyanates, and the well known inorganic economic poisons, arsenious oxide, sulphur, metallic salts, and fluorine compounds. The new scientific pest control by use of chemicals and the quantity application of economic poisons to the need of man, have occurred mostly during the past half-century.

Prior to World War II, the United States was the greatest user of pyrethrum, nearly all of which was imported from Japan and the Kenya colony in East Africa. History records that the greatest number of casualties in all wars of former generations have been from disease: The house fly carried dysentery and typhoid, mosquitoes carried malaria and yellow fever, and the louse carried typhus. Just when pyrethrum was most needed, the war shut off the sources for these United States, and even with increased knowledge of insect control, this country was threatened, due to curtailment of supply, with the same difficulties that beset other military

conflicts. Since pyrethrum and derris are expensive to produce, investigators have for a score or more of years unsuccessfully been seeking a cheap synthetic contact insecticide, which would be as effective as pyrethrins and rotenone. Organic thiocyanates are available, which have been produced at the rate of over one million gallons per year. Others were tried which were poisonous to insects, but none of the others was wholly satisfactory. Then DDT for insecticides was uncovered and after test it appeared as good or better than pyrethrins or rotenone and almost exactly what the armed services needed. DDT insecticides are slower in action than some now in use, but through residual action, may remain effective for a long time.

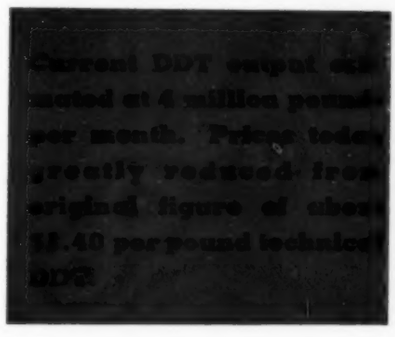
A summary of existing data on DDT insecticides is difficult to keep up to date due to continued rapid discovery and development of new information. However, it is possible to record the recognized facts. Probably no insecticidal material has received more publicity. It will take several years to utilize fully all that has been discovered. It is estimated that over 2,000 articles have been written on this subject. The research is vast, in some cases the conclusions are contradictory, and lack of complete information on the subject renders certain statements tentative and therefore open to possible early revision. It is not the intention of this article to cover all the extensive literature but to give basic information as to its usefulness and limitations, and to furnish a dependable and accurate presentation for dealers in and users of economic poison products. All of the statements herein may not necessarily be substantiated, for some have been received verbally; however, it is believed the following pages afford a concensus of current dependable views on the subject and the present situation.

Chemistry and Development

THE new insecticide known by the term dichloro-diphenyl-trichloroethane, sometimes written without the hyphens, popularly known as DDT, is the resultant, in the presence of concentrated sulphuric acid, of the inter-action of monochlorobenzene and chloral hydrate. This resultant is sold as DDT technical grade, setting point 89°C., which is used in compounding DDT insecticides, and may contain several configurations or isomeric compounds, that is, compounds composed of the same elements united in the same proportion by weight, but differing in one or more properties because of differences in molecular structure. The isomers appear largely by chance, just as several men may group themselves differently with respect to one another. The para para, ortho para, and ortho ortho isomers have been found and isolated.

DDT technical grade usually consists of about 75% of the most desirable isomer, the para para product known chemically as 1, 1, 1-trichloro-2, 2 bis (parachlorophenyl)-ethane. This pure isomer is loosely referred to as dichloro-diphenyl-trichloroethane, and has a sharp melting point (the reverse of setting point) of about 109° C. Purification of crude DDT is a difficult process because of the close relationship of several isomers normally present in the technical material. The ortho para product would be a fairly good insecticide if the much better para para product were not available. All these normal impurities are regarded insecticidally as active ingredients.

The para para isomer of DDT was first prepared in 1874 by a student working on his doctor's thesis in Alsace as a routine chemical compound in an abstract academic study, but it was not then suspected to have value and was not produced on a commercial scale. Its insecticidal property was not much realized until in 1942, and since then has been produced in large quantity. At the end of 1945, it was reported that DDT was being produced in the United States by licensed firms at the rate of 2,750,000 pounds a month. This was less than the civilian demand of this country. Europe obtained its required quantities from England and Switzerland. More recently, it has been said that the production is 4,000,000 pounds a month.



Many species of plant life produce organic repellents, irritants and poisons such as formic acid, rotenone, pyrethrins, saponins, alkaloids and toxalbumins, which ward off incursions against them or their progeny. Eventually these substances are inactivated by oxidation, reduction, hydrolysis, or other similar chemical processes. It might be disastrous if they did not disappear. Except for organic thiocyanates, DDT is the first synthetic organic poison for pest control to have been distributed in quantity. We do not yet know the aftermath, but it is believed that in a manner similar to that of the plant products, it will slowly be decomposed by nature and disappear, and not upset the balance of nature in fields, forests and streams. However, sound reasoning dictates that DDT should be used with careful consideration.

The propensity of DDT to split off hydrochloric acid is enhanced by alkaline substances, by sunlight, by presence of ferric oxide, or of iron and aluminum chlorides. It is known that Fuller's earth and some similar products show catalytic activity which is probably due to presence of small amounts of iron compounds. Even its first decomposition products have very much lower insecticidal potency.

The pure para para product is colorless and nearly odorless, and is a fairly stable chemical compound under most circumstances. It is not affected by ordinary heat but does respond to exposure to the atmosphere and the actinic rays of the sun. It is an alongate crystalline substance insoluble in water but soluble in most organic solvents, such as acetone, carbon tetrachloride and petroleum oil. DDT technical grade is

a powdery or lumpy material, may be sticky or oily or waxy, colored light tan to brown, and has a faint pleasing odor.

Competitive Products

WE are living in a chemical age, and it is to be expected that pests will be controlled more and more by synthetic organic insecticides. Already, other chemicals similar to DDT are seeking acclaim. Derris and cube', products of nature, in addition to rotenone, contain a number of insecticidally active principles difficult to separate, and chemistry has produced DDT which refers to some related impurities as well as a mixture of isomers, which vary somewhat in quantity dependent on manufacturing conditions. In like manner, the British product "666," gammexane, refers to a mixture of isomers. The gamma isomer of gammexane is accountable for the proven insecticidal properties of a mixture of the isomers and is known chemically as hexachlorocyclohexane. On account of the present objectionable odor, hexachlorocyclohexane technical grade is considered as unsuitable for use in household insecticides. Some concentration of the isomers can be obtained by taking advantage of their differences in solubility. There are several other illustrations of a synthetic organic chemical product comprised of related insecticidally active principles, such as difluoro-diphenyltrichloroethane (FDDT), dichlorodiphenyl - dichloroethane, "bladan" (hexaethyltetraphosphate), "Velsicol 1068" (presumably a chlorinated alkylated naphthalene derivative), and "piperonyl cyclohexenone" (described as essentially ketone and ester forms of the compound). This paragraph is intended to show that new synthetic organic insecticides have ushered in a new era involving complications of terminology and labeling. We may expect continuing research to add a great many new synthetic organic economic poison products to serve agriculture and to aid in controlling household insects.

One of the unique properties of DDT insecticide is its long-lasting residual effect against flies, mosquitoes, gnats, bedbugs, fleas and certain other insects; that is, it kills those which are present at the time, and those which arrive long afterward and alight on the area. The DDT residue sticks when applied to surfaces. It is the only insecticide known that exhibits such a marked effect.

DDT is supposed to have no repellent or fumigating effect, but it has remarkable though usually slow residual killing power. It is a stomach poison when eaten by the pests, but more especially and outstandingly, it is a contact insecticide that is absorbed into the body of the insect when sprayed directly onto it, or absorbed into its feet as it crawls over and touches the residue left on a treated surface after the spray has dried. Oil and very fine dusts sometimes acts as respiratory insecticides, which suffocate the pest by entering or clogging its trachea. Insects of many species that contact DDT spray or dust very promptly show excitement. Direct contact of the liquid spray with many insects will kill them quite rapidly, but it may be several hours before death follows from effects of the amount absorbed from walking or crawling over a dry DDT deposit. In any case, it acts on the nervous system, and progressive paralysis and death of the insect follow.

Abnormalities of insects may show that they have been affected by DDT. A fly may be stimulated into active erratic flight but eventually will have a drooping wing. Bedbugs do not hide as is their habit but may crawl about by day in the open, and caterpillars are soon obviously no longer healthy. Insects in such condition or with tremors or incoordination of movement will die in a few minutes or hours.

Preparations and Application

ALTHOUGH DDT is not a panacea to end all insect pests, it is a most outstanding material which is rapidly finding its proper place in insect control. The use of DDT combined with a diluent or carrier for insecticidal purposes, is covered by U. S. Government Patent No. 2,329,-074, Sept. 7, 1943, by J. R. Geigy, Basel, A.G., Switzerland. Geigy & Co., New York, N. Y., is the U. S. affiliate of this firm. The American firm licenses the preparation for formulations of DDT for use or sale as insecticides. The material is compatible with all spray and dust insecticides tested except those containing lime or other alkaline reacting material. It is effective against many pests, but not all.

There are four general types of DDT insecticide preparations of various percentages on the market, namely, ordinary solutions, emulsive solutions, dusts, and wettable powder to be suspended in water for spraying. In many cases there is a difference in effectiveness against insects between dusts, suspensions, suspensions with wetting agent, petroleum oil emulsions and aerosols. Frequently more than one class of material is effective for a given purpose, but the DDT percentage may need to be higher in one than in another. DDT is soluble in certain proportions in solvents such as kerosene, petroleum spray oil, benzene, trichloroethane, acetone, carbon tetrachloride, alcohol and ether. The solubility of DDT in petroleum oil decreases with a decrease in temperature. As much as a half more DDT may be dissolved in a naphthenic-base petroleum oil than is possible in a paraffinic-base petroleum oil, which is an important consideration when the product is to be stored at subzero temperatures. An auxiliary solvent, such as used in the aerosol bomb mixture, may be added to increase solubility and to retard seeding and crystallization from the maximum amount at any required low temperature. Various substances, such as anthracenes or heavy aromatic naphtha (alkylated naphthalene fraction), are used to maintain complete solution.

The liquids for space sprays and for surface application for control of household insects are mostly DDT dissolved in kerosene which even if used alone would injure foliage and have a cutaneous effect on livestock. DDT 1% or less in kerosene with a knock-down agent makes space type sprays which should always be used in their original form.

A surface spray is sometimes made of a light spray base petroleum oil, which will not injure skin, containing DDT 5% and an emulsifier, which makes it convenient for direct surface application, miscible with water for convenience of spreading and easier coverage as a residual spray, or application to foliage when adequately diluted. A spray for surface application and a space type spray are for different purposes and should not be expected to be interchangeable. The most economical usage is application of the surface spray for its residual insecticidal effect. There is little hope of standardizing such products, on account of the various grades and purity of the solvent and its combination with different emulsifiers.

Owing to its nature, DDT alone is not a practical insecticide but must be dissolved to produce a spray, milled with one to three parts of inert material to make a fine powder suitable for suspending in water, or mixed with a large proportion of ingredient such as prophyllite, talc, sulphur, or other material, and milled for applying as a dust. The subject of particle size needs more consideration. Fineness is the important factor for ease of application and effectiveness of powder preparations of DDT physically suspended in water. The product must be very fine so as to increase insecticidal efficiency and not to settle out or clog spray equipment. Such products vary from DDT 25 to 50%, which is the highest practicable amount. Some contain a spreading agent to produce wetting of the plant surface. This agent must not be alkaline in order not to decompose the DDT.

DDT preparations for application as dust have varied from DDT 1 to 20%, and the inert ingredient should be adhesive enough to stick the material to the leaf but not sufficiently abrasive to injure seriously equipment with which it is applied. The dust should be no stronger than is necessary to control the pest by a light covering. The blowers and type of equipment for applying DDT dust are extremely important. Spray machines used for applying suspensions must have ample agitation in order not to clog.

Aerosol insecticides successfully used by the armed forces in their struggle against harmful insects, have been a challenge to regular petroleum oil base sprays especially for control of household pests because aerosol suspends a solid or liquid in gaseous form. Aerosol bombs are very effective for applying space spray for quick knockdown of insects and have been widely advertised for civilian use. Aerosols have shown promise for field use. They are produced by license for a particular formula from U.S.D.A. Administrator of Agricultural Research under public service patent 2,321,023. One should not expect to use them to achieve residual effect, which can be more easily obtained with a heavier spray base as a carrier. The intrigued public was reluctant to pay the premium-prices asked for special dispensers, and to answer the objection, the refillable bomb and a cheaper aerosol were developed. The aerosol in turn is now about to be challenged by a new hand-operated type of sprayer that uses oil base insecticides and delivers fine sized particles in measured quantities.

The stability of DDT when heated enables application of some DDT insecticides by volatilization from hot plates, various fog machines, or other heating methods or devices delivering the insecticide in form of vapor or smoke. A report from the United States Navy, Bureau of Medicine and Surgery, June 17, 1945, in describing the application of DDT solution by means of a venturi tube device for attachment to a vehicle exhaust smoke generator, states that injected oil solution is carried by the hot gasses against a heating element which increases vaporization of the solution. It is stated that since the smoke is heated, it tends to rise vertically, especially in wooded country; but in the open at wind speeds above 12 miles per hour it remains close to the ground. In the use of smoke aerosols on agricultural crops and on cattle in the West the thermal relationship between air and ground at the season of the year when needed has been such that still air is acceptable in which to use smoke aerosols and a drift of from one to two miles per hour is ideal. It would appear that conditions for ideal use are as rigorous as for application of sprays by helicopters or standard airplanes.

Entomologists are still striving to determine the exact value of DDT for controlling insect and mite pests. It is perhaps as important to ascertain what is wrong with an insecticide as to learn the characteristics that are satisfactory. One must be cautious and know its limitations as well as its good qualities. Some entomologists think where DDT has been properly applied and found effective that present dosages are much too high and therefore wasteful of material besides increasing a possible hazard. One should not use too much, but a reduction in concentration or amount is not recommended until a proper dose of DDT has been proved for each specific purpose under various conditions.

The spray which runs off is of course wasted. There is also a loss in applying material for its residual surface effect when employing unsuitable equipment such as that designed for field pests, whereas low pressure equipment to afford a coarse spray is more desirable and economical. Orchard type sprayers unless properly adjusted may apply too much. Care should be exercised against over application. For many uses an oil solution DDT insecticide can be applied more easily and better than a dust, because of better atomizing equipment. Whenever insecticidal material is to be diluted, it should be stirred or shaken thoroughly to obtain a uniform mixture or solution before use. Special directions for use of DDT insecticides against specific insects or on particular hosts are available from many official and other sources as well as on the label of each product, so no attempt is made to include details in this article.

(*Part II of "Resumé of DDT for Agriculture" will appear in the February issue. The forthcoming article will discuss further the history and use of the insecticide.*)

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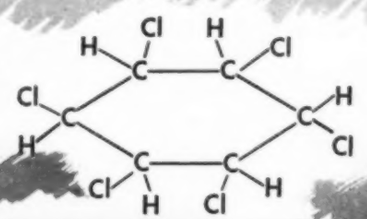

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Economic Entomologists Meet . . . Dr. E. N. Cory Elected President

A PLEA for wider cooperation among all persons and agencies interested in and responsible for prevention and control of insect infestations was made by P. N. Annand, Chief of the Bureau of Entomology and Plant Quarantine, U.S.D.A., at the December joint meeting of the American Association of Economic Entomologists and the Entomological Society of America. The four day session, beginning December 9, was held in the John Marshall Hotel, Richmond, Va.

Officers for 1947 were named by the A.A.E.E. as follows: President, Dr. E. N. Cory, head of the Department of Entomology, University of Maryland, College Park. Dr. Cory, formerly secretary of the association, succeeds Dr. Clay Lyle of State College, Mississippi. Dr. B. A. Porter, Leader of the Division of Fruit Insect Investigations, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington, was elected first vice-president. A new secretary was to be selected by the association's executive committee.

New officers of the E.S.A. were also named at the meeting. They are Dr. C. P. Metcalf, president, succeeding Dr. C. F. W. Muesebeck of the Bureau of Entomology and Plant Quarantine, U.S.D.A.; first vice-president, Roger C. Smith, Manhattan, Kansas, succeeding Samuel A. Graham of the University of Michigan. Herbert H. Ross of the Illinois Natural History Survey, Urbana, remains as secretary-treasurer.

Some 65 papers were presented by members of both groups. Topics covered a very wide range extending from discussions of geologic history of insect life, up to announcements and discussions of the latest developments in toxic materials for insect control. Newly-developed agents such as hexaethyltetraphosphate, hexachlorocyclohexane (or, "benzene hexachloride") were accorded progress reports, along with voluminous data on the control of aphids, mosquitoes, beetles, corn borers, termites, fruit moths, pear psylla, leafhoppers, codling moth, red spider, mites, and other insects affecting livestock, field crops, forests, and greenhouse crops.

In his talk entitled "Preventive Entomology," Dr. Annand indicated that although scores of new and powerful insecticides are being introduced currently to bring about more effective methods of control, it is the safest policy to practice sanitation, immunization, isolation and good hygiene in agriculture, to prevent outbreaks of insect pests. He cited the $47,000,000 annual loss from grasshopper infestations, and stated that although good methods of control are available, application is sometimes too late after the infestation has begun. "The division between preventive entomology and direct control is not a distinct one," he said. "In fact, some prevention is dependent upon the application of direct control so timed or so directed as to make such control in other instances unnecessary or more effective."

As to requirements for a more fully effective and more systematic procedure to establish preventive entomology, Dr. Annand stated that foreign and domestic quarantines restrict the spread of insect pests, but cannot suffice entirely. "At best, quarantines must be a compromise between the perfect protection desired and the necessities of a country whose citizens must have commercial dealings with their neighbors, whether foreign or domestic. To be completely protected from artificial movement of pests, all trade and travel between quarantined and unquarantined areas would have to be reduced drastically or stopped altogether." But imperfect as they are, quarantines do give some protection, and should be intelligently strengthened. In this respect, the Quarantine Act should give more authority to its enforcers to deal with emergencies and to provide safeguards against introduction of foreign plant pests, he indicated. However, despite all the improvements that may be made, "it is not likely that all destructive insects not now present in the United States can be permanently excluded," he continued. It was pointed out further, that in the past, discovery of insect pests had been made largely by accident, often after they had gained a solid foothold. "As a second line of defense, plans should be perfected to detect them as soon as possible after introduction, so that steps may be taken to eradicate or restrict them."

Dr. Annand told of a suggested plan to survey not only port areas of the United States in search of invading insects, but to cover as well, interior points of the country, particularly airports. Hindrances to such a plan include the heavy cost, and reluctance of competent men to lead the nomadic life such a survey would demand. Cooperative arrangements

Dr. Charles F. Muesbeck
Retiring President of Entomological Society of America.

might be made between the states and the Bureau of Entomology and Plant Quarantine, for such surveys and those which seek to determine current status of established pests but present funds available are insufficient to carry out such a broad survey. However, hopes are held for the future which might see an organized crop-pest reporting service comparable to that now given to the farmers on the weather so the status of these two important factors affecting crops would be given. "Even now, a limited amount of forecasting is possible with certain insects," he said.

Early and organized suppression of incipient outbreaks and eradication or control of introduced insects have an important part in a preventive program. Some funds have been appropriated by the Federal Government for this purpose, but greater participation by the states themselves would add effectiveness and flexibility to the plan. Dr. Annand observed.

The application of preventive measures, especially by farmers, requires education, demonstration and persuasion. This in turn requires the services of extension entomologists, of whom there are but relatively few in the U. S. This shortage restricts severely the carrying of research results to large-scale field tests so that the maximum benefit can be obtained both as a final step in the research process and in educating both the extension agents and the public. It is particularly important that there be sufficient contact between research and extension so that new methods may be adopted without too great delay, and that subsequent difficulties will be eased through further research.

In his discussion of the correlation between federal and state legislation regulating economic poisons, W. G. Reed, chief of the insecticide division of the Bureau of Entomology and Plant Quarantine, U.S.D.A., reviewed the Federal Act of 1910, pointing out its inadequacies and describing steps being taken to enact modern, uniform legislation. Whereas the present Federal law does not take into account rodenticides and herbicides as economic poisons, the new suggested statute covers the field in a comprehensive manner. It includes, in addition to actual chemical poisons, such devices intended for killing or trap-

Dr. P. N. Sanders, (left) editor of Southern Planter discusses the day's program with Dr. J. van der Vecht of Buitenzorg, Java. The latter told the group of his experiences as a Japanese prisoner of war.

ping insects, fungi, or rodents. The proposed bill also contains a number of provisions intended to prevent injury to man and animals, specifying that such materials should carry "poison" labels, with skull and cross bone insignia, and an antidote statement. Coloration of poison powders is also a part of the public protection under the suggested law, in order that toxic white powders may not be mistaken for foodstuffs of similar appearance.

The subject of registration, termed by Mr. Reed as being "Probably one of the most discussed features of the bill," received its share of attention. "As recommended by the House Committee on Agriculture, there would be only one registration (not annual registration) for each individual economic poison," he said. "As indicated by the Committee's report on the bill, the purpose of registration is to bring products to the immediate attention of the department in order to prevent violations, rather than to allow them to exist for a considerable period of time before interstate shipments of the product are encountered by investigators."

Mr. Reed focused attention on the matter of co-operation, one feature of the bill which he said had not been very much publicized, but which may be of outstanding importance. It has been a frequent complaint that manufacturers with wide distribution of insecticides have found it difficult to comply with the Federal law and at the same time with all the State laws involved. This section of the bill authorized the Secretary of Agriculture "to cooperate with official regulatory agencies of States . . . in securing uniformity of regulations," he indicated. "This . . . is a recognition of the fact that Federal and State laws do overlap and that there is a definite intention that this shall not result in confusion or cause difficulty in the distribution of effective economic poisons."

The matter of labeling requirements was discussed, with Mr. Reed reviewing the obvious shortcomings of the present act and presenting the steps taken to remedy it. He told of the joint action of the Council of State Governments and the U. S. Department of Justice in preparing a uniform state regulatory bill, which, he said, differs in some respects from the Federal bill. Two of the chief dissimilarities of the bills lie in the ingredient statement and the provisions for registration.

Under the proposed uniform State law, the ingredient statement means the printing of the name and percentage of each active ingredient, together with the total percentage of the inert ingredients. Or, a statement may be made of the name of each active ingredient, together with the name of each and total percentage of the inert ingredients. The exceptions are in the case of poisons toxic to man, or when the economic poison contains arsenic in any form. In the latter case, a statement of the percentages of total and water-soluble arsenic is to be made.

Under provisions of the State bill, economic poisons must be reregistered annually. This, however, does not necessarily indicate that such means annual registration in every case, Mr. Reed pointed out. At the discretion of the State enforcement officials, economic poisons which have been registered under the Federal act and shipped into the State for sale or distribution in the original unbroken container, may be exempted from State registration. Mr. Reed stated that "some states would welcome such an arrangement; others probably will desire to register all products regardless of where they originate."

New Products Discussed

A NUMBER of new insecticides were discussed at length in an evening meeting of the Insecticide Section under the chairmanship of Dr. G. C. Decker attended by some 300 persons. Dr. C. C. Compton of Julius Hyman Co., Denver, Colo., described the new chlorinated hydro carbon insecticide which is to appear under the trade name "Octa-Klor" in addition to its other designation as used by Velsicol Corporation of Chicago, "1068".

Dr. E. N. Woodbury of Hercules Powder Company, Wilmington, described the product "Toxaphene," prepared under the formula C_{10} H_{10} Cl_8 stating that it is a contact insecticide, but also acts as a stomach poison. It has been found to be effective against grasshoppers, cotton insects, sugar cane aphids, and other agricultural pests.

The insecticides piperonyl cyclohexenone and piperonyl butoxide

(*Turn to Page* 50B)

J. S. Houser of Ohio State, S. A. Rohwer of the Bureau of Entomology and Plant Quarantine, and George N. Wolcott of Puerto Rico gather at the recent entomological meeting in Richmond.

Experience with Dithiocarbamate Fungicides in the Northeastern States

FUNGICIDES suitable for use on fruit crops are hard to find. Copper and sulfur fungicides now in general use are far from from perfect and will probably be replaced as more suitable ones are produced. Many new organic fungicides have been developed and tested experimentally during the past few years. The better ones are now finding a place in fruit spray programs but only those which meet the especial requirements of a fruit tree fungicide can be expected to find general acceptance.

Most tree fruits must be protected from one fungus disease or another during the entire growing season, which means many applications of spray or dust. Apples, for example, may receive eight or ten fungicidal spray applications during the year. Even when the sprays are spaced only 10 days apart, one or two new leaves may develop between applications and these are subject to infection if weather conditions are favorable. A good fungicide, therefore, should be able to eradicate or render impotent those infections that are already established and at the same time afford protection to sprayed parts and new growth which will develop before the next application is made. All this is expected to take place without injury to the tree, even though some sprays are applied under the cool, wet conditions of early spring and others are applied under the hot, dry conditions of midsummer.

If they are to be widely used, fungicides must be compatible with the insecticides commonly used on fruit crops. That is, they must maintain their own fungitoxicity, not interfere with the toxicity of the insecticide to the insect, and have the mixture remain nontoxic to the host plant. Fungicides should leave as little visible residue as possible and no residue toxic to humans. Only those that are easily handled will be acceptible to fruit growers who demand a product that can be placed in the spray tank with neither mess nor loss of time. Finally, the preparation must be economical, not figured on the cost per pound of fungicide but on the cost per bushel of clean fruit. Sulfur and copper fungicides have failed to meet many of these requirements and some of the newly developed organic fungicides have been substituted in the spray program for fruit trees in the Northeast.

This paper deals with the dithiocarbamate fungicides which, since their introduction in 1941 have been used in increasing quantities to supplement the usual sulfur spray programs on apples, pears and stone fruits. Ferric dimethyldithiocarbamate has had the widest acceptance as a fruit fungicide. "Fermate" and "Karbam" are commercial products containing 70% ferric dimethyldithiocarbamate as the active ingredient. To avoid repeating such a long word the letters FDDC will be used throughout this paper in referring to this group and ZDDC will refer to the zinc dimethyldithiocarbamates represented by such products as "Zerlate" and "Methosan." Lead and copper salts of dimethyldithiocarbamic acid have also been made and given experimental tests on fruit trees but have not proven as satisfactory as the iron and zinc salts. Disodium ethylene bisdithiocarbamate hexahydrate is the basis of another group of related fungicides represented in the market by "Dithane." This type has been used extensively on vegetables but experiments on fruit crops have not yet been completed. Of the above materials, FDDC is the only one which has passed beyond the experimental stage as far as fruit disease control is concerned and consequently this paper will deal largely with it and point out some of its advantages over the sulfur and copper materials now used.

Effective Against More Fungi

IN the Northeastern section of the United States where McIntosh is the leading apple variety and scab (caused by *Venturia inaequalis*) is the chief fungus disease, sulfur for the past 30 years has been the common fungicide used in most orchards for all spray or dust applications from the pre-pink to the fourth cover. Liquid lime-sulfur was generally used until about 1935, and was very effective in controlling apple scab. It had a very high initial toxicity to the fungus and possessed the property of eradicating established infections and yet dried into a protective film which was not easily removed by rain. It was gradually replaced by wettable sulfur fungicides because of the former's toxicity to trees which resulted in reduced yields.

The wettable sulfurs are mainly

By Dr. D. H. Palmiter

N. Y. State Agricultural Experiment Station
Hudson Valley Fruit Investigation,
Poughkeepsie, N. Y.

protective in their action and hence less effective than lime sulfur. FDDC is similar to the wettable sulfurs in that it is mainly protective but on a higher scale, that is, at 1½-100 it has given equal or better control than the best dry wettable sulfur at 6-100. FDDC ½-100 plus sulfur 3-100 has resulted in good scab control and many growers are using this combination because it is more economical than the straight FDDC program, and more effective than the straight sulfur program. Where scab is the only problem, FDDC can hardly compete with sulfur at the present prices. However, many orchards contain a mixture of varieties other than McIntosh which are subject to various diseases besides scab, for example, cedar-apple rust on Rome Beauty, Wealthy, Winter Banana, Jonathan and others; Quince rust which can affect most any variety including McIntosh, but is especially bad on Cortland, and Delicious; Brooks fruit spot which may trouble Baldwin, Rome Beauty, and Golden Delicious; and bitter rot which in certain areas takes a toll of Rhode Island Greening and Northern Spy and in some cases even McIntosh. None of these diseases are controlled by sulfur. Since these varieties are often interplanted with McIntosh, many growers are in need of a fungicide which will control these other diseases along with apple scab.

FDDC has been widely accepted by apple growers in the Northeast for control of Cedar-apple rust and quince rust on apples. Field experiments conducted in the Hudson Valley where these two rust diseases are a serious problem have shown that one half pound of "Fermate" will give better control than six pounds of wettable sulfur. Where scab and rust-susceptible varieties are both sprayed together, a common practice is to use a combination of "Fermate" ½-100 and sulfur 3-100. Experiments have proven this an economical and efficient way to control both diseases. Since the bloom period is a very critical one for rust control, the pink application should contain FDDC at 1 or 1½-100 unless a special bloom application of FDDC at ½-100 is to be applied. The complete rust schedule calls for FDDC in the pink, bloom, petal-fall, 10-day and first cover applications. Where dust is used in place of spray, a four per cent concentration of FDDC in a sulfur dust or 10 per cent in talc has resulted in good control of apple scab, cedar-apple rust, and quince rust.

Brooks fruit spot (caused by *Mycosphaerella pomi*) has been controlled successfully on Rome Beauty by using FDDC as the fungicide in the post bloom sprays. In 1943, fruit from plots sprayed with wettable sulfur 5-100 averaged 5% scab, 12% cedar-apple rust, 15% quince rust, and 13% Brooks fruit spot. Fruit from plots sprayed with "Fermate" 1-100 averaged 1% scab, 0.4% cedar-apple rust, 0.3% quince rust, and no fruit spot.

Bitter rot (caused by *Glomerella cingulata*) has not occurred frequently enough in the Hudson Valley to make experimental field tests possible, but reports from other states indicate effective control from the use of FDDC in the cover applications.

The three common fungus diseases of pears in the Northeast are scab (caused by *Venturia pyrina*), leaf and fruit spot (caused by *Fabraea maculata*), and sooty blotch (caused by *Gloedes pomigena*). Sulfur applied at frequent intervals throughout the season will control all three diseases, but its use in the summer is often neglected due to the danger of injury. FDDC has been used experimentally for the control of the Fabrae spot and sooty blotch with excellent results where three cover applications were made, and no injury has been noticed.

Brown rot (caused by *Sclerotinia fruiticula*) and Cherry leaf-spot (caused by *Coccomyces hiemalis*) are the two common fungus diseases of sweet cherries. Sulfur fungicides leave an objectionable odor and are not too satisfactory for the control of either of these diseases. FDDC substituted in place of sulfur in two applications preceding harvest has improved the control of fruit rot, and also the control of leaf spot. It has also at the same time avoided the objectionable residue left by sulfur applications.

Less Injury Noted

COPPER fungicides have not been popular in the apple spray program in the Northeast in recent years because of the injury that results under certain weather conditions even though the copper spray applications are delayed until after petal-fall. Wettable sulfur fungicides have largely replaced liquid lime-sulfur because the latter are less injurious. But even the wettable sulfurs in combination with arsenate of lead cause considerable spray russet injury to such varieties as Delicious, Golden Delicious, and Baldwins during seasons when wet weather prevails at the time of the pink and petal-fall applications. FDDC in combination with arsenate of lead under the same conditions, has almost eliminated russet injury on Delicious and has greatly reduced it on other varieties. Wettable sulfur used in the cover sprays often results in sulfur-sun scald on the exposed fruit on the south side of the trees. Cortland, Rhode Island Greening, Golden Delicious, and Baldwin are quite susceptible to this type of injury if the temperature goes above 85° F. during or following the application of sulfur fungicides. FDDC applications under the same conditions have never been known to result in this type of injury. Combinations of FDDC with sulfur are not safe from sun scald.

Arsenate of lead injury which results in a black area at the blossom

end of apples may be largely eliminated by using FDDC in place of sulfur in the pink, petal-fall and 10-day applications. If used throughout the cover sprays, it will also avoid sulfur-sun scald and prevent the typical marginal leaf injury which commonly occurs during hot, dry seasons on plots which received the usual sulfur-arsenate of lead combination.

From the above, one should not conclude that the dithiocarbamate fungicides never cause injury to fruit trees. Orchard experiments have shown FDDC to be one of least injurious of this group and yet it is not entirely free from injury. In such extremely wet seasons as 1945 the blossom end of McIntosh and Golden Delicious showed a slight russet in New York, and leaf injury has been reported from other states. Leaf injury may occur on some varieties if lime is used in combination with the FDDC. However, in most seasons the injury is less than that on sulfur sprayed plots.

Some of the other dithiocarbamates are more limited in their use because of the injury they cause on certain plants. The copper and zinc carbamates are not safe on apples because of the russet injury to the fruit and the stunting of the leaves. The disodium ethylene bisdithiocarbamates are not safe on tree fruits in combination with arsenate of lead unless some safener is included. The zinc-lime mixture commonly used with these fungicides on vegetables is not satisfactory on tree fruits because the zinc is also injurious.

FDDC has been found a safe summer fungicide for use on pears to avoid the sun scald fruit injury which sometimes follows summer applications of sulfur, especially if oil sprays have been used for psylla control. FDDC has been used on sweet cherries without injury, and ZDDC has appeared safe in two seasons' experiments. It has also been used experimentally on both European and Japanese varieties of plums without evidence of injury. Summer applications of FDDC and ZDDC on peaches have been safe. Lime which is commonly used as a corrective with arsenate of lead should be omitted when FDDC is used since lime reduces the effectiveness of the fungicide and increases the danger of injury, and on apples the FDDC is a sufficient corrective for arsenical injury.

Compatibility With Insecticides

BESIDES being compatible with arsenate of lead as indicated above, FDDC has been used successfully in combination with rotenone, wettable DDT and oil, and nicotine on apple trees. The use of FDDC with DDT has been questioned since ferric salts have been shown to act as catalyzers in the decomposition of the ferric salts under high temperatures. However, the small amount of iron needed for catalytic action is probably found as a contaminant in most spray materials or in the water used, and yet under orchard conditions has not destroyed the effectiveness of the DDT. At any rate, the combination of FDDC and DDT gave satisfactory control of Japanese beetle on plums and control of codling moth on apples in 1946, and no injury was observed. Besides being compatible with the above insecticides, FDDC and ZDDC possess some insecticidal value of their own since they act as repellents to such fruit tree insects as Japanese beetles and rose chafers.

Visible and Toxic Residues

ONE of the disadvantages of sulfur is that such large amounts are required for control that repeated applications build up a light colored residue which is objectionable on fresh fruit. While neither the sulfur nor FDDC residues are toxic to consumers, any fruit with a spray residue is looked upon with suspicion. This problem is not so important on apples since there is usually a long period of weathering from the time of the last sulfur application until harvest, and most of the residue is outgrown or weathered off. The only time FDDC has caused unsightly residue on apples has occurred when it is used in combination with oil. If several applications are to be made the fungicide should be reduced to 3/4-100 or omitted from every other application.

On stone fruits, such as sweet cherries and plums, spray residue is a more serious problem. Even such low concentrations as three pounds of dry wettable sulfur applied to dark fruited varieties of cherries at the critical brown rot period just before harvest, will leave an unsightly finish. On the other hand, one pound of FDDC with a suitable spreader will leave a dark residue scarcely visible on dark colored cherries or plums, and ZDDC has been used experimentally to reduce with favorable results, the amount of visible residue on light colored cherries and peaches.

FDDC is not difficult to handle. Being a fluffy powder, it can be packaged like wettable sulfur in large or small sized paper bags or cartons. It is not difficult to wet if placed in a screen box and washed into the tank, or placed in a pail with a little water and stirred into a slurry before it is poured into the spray tank. It has good dusting properties either as 4% FDDC in a sulfur dust or as a 10% FDDC talc dust.

The powdered FDDC may be irritating to the skin of some individuals if it is allowed to remain in close contact for several hours, but the writer has worked with various forms of the material for five years with less trouble than that encountered in handling sulfur.

Organic chemicals will probably always cost more per pound than sulfur, but not necessarily more for producing a crop of fruit free from disease and injury. The cost of the fungicide for scab control on susceptible varieties such as McIntosh is at the present prices, about 90 cents for 100 gallons of FDDC spray, and about 45 cents if wettable sulfur is used. However, for the rust diseases it costs less than sulfur because it is so effective that only small amounts are required. In most cases, where FDDC fungicides are being used at present it is not a question of competing with sulfur, for they are doing a job that sulfur failed to do and growers are willing to pay extra for such a material.★★

Fumigation of grains and other stored foods

By R. T. Cotton and H. H. Walkden
USDA, Agricultural Research Administration Bureau of Entomology and Plant Quarantine

PART II

Part One of this article, printed in the December, 1946 issue, discussed the problems involved in fumigation, including building construction and air leakage. Part two concludes the story.

THE type of package has a direct bearing on the case of penetration by fumigants. Fumigants penetrate commodities in cardboard cartons much less readily than they do those in fabric bags, and a commodity that is wrapped in paper as well as being packaged in a carton is penetrated still less readily because of the dead air spaces created by the wrappers. Circulation of the atmosphere by fans greatly improves gas penetration when commodities are packaged in cartons.

Insects are not serious pests in the northern portion of the grain-growing regions of the United States, since temperatures do not rise high enough during the summer to permit rapid development of infestations, and low winter temperatures tend to kill out such infestations as do develop. The higher warm season temperatures that prevail in the more southern States, i.e., south of the 41st parallel, are favorable to rapid development, and insect infestation becomes a major hazard in the storage of grain. In all regions it is advisable to inspect stored grain once a month during periods when the temperature of the grain reaches 70° F., and to fumigate if it is found to contain one or more weevils or lesser grain borers or 15 or more bran beetles per quart.

As a general practice wheat stored in farm-type bins, in the region of or south of the 41st parallel, should be fumigated in August and again late in September or October. This will insure the destruction of insects so that the wheat will cool normally in the fall and winter and remain in good condition until midsummer of the following year.

Corn grown in the commercial corn area is usually stored for the first season on the ear in slatted bins, which are unsuitable for fumigation. Normally this corn is used as feed during the summer following harvest. If corn is stored for more than one season, it should be shelled and placed in tight bins suitable for fumigation. Shelled corn should be inspected with the same frequency as recommended for wheat, and should be fumigated when found to be infested by as many as one weevil or 25 bran beetles per quart.

In the deep South grain commonly becomes infested while still in the field. Here it is desirable to store ear corn in bins which allow for ventilation but which can also be made tight enough for fumigation, and it should be fumigated immediately after being placed in storage.

Fumigants and dosages found satisfactory for the control of insects in farm-stored wheat and corn are in table at bottom of this page.

For the fumigation of wheat in elevator storage any of the fumigants listed in table 1 can be used at the dosage recommended for treating wheat in steel bins. In wooden cribs the dosage should be doubled. In addition to these fumigants, calcium cyanide at 10 pounds and chloropicrin at 2 pounds per 1000 bushels can be used. They are applied with equipment specially designed to feed the chemicals into the grain stream at any desired speed and dosage.

Fumigation offers a rapid and effective method of destroying insect life in stored seed. If the proper pre-

Table I

Fumigants and dosages for the treatment of grain stored in steel bins

Fumigant	*Mixture Rate by Volume*	*Dosage per 1000 Bu. Wheat Gallons*	*Corn Gallons*
Carbon tetrachloride	....	3	4
Carbon tetrachloride with—			
Ethylene dibromide	19:1	2	..
Carbon disulfide	4:1	2	5
Ethylene dichloride	1:3	4	5
Ethylene dichloride (1:3) plus methyl bromide 10%	....	2[1]	2
Chloropicrin	6:1	1½[1]	1
B-methyllallyl chloride	3:1	2	2
1,1-dichloro-1-nitroethane	5:1	1½	1

[1] Germination may be materially reduced at these dosages.

cautions are taken, no damage to germination need be feared. Most fumigants, however, are likely to lower the viability of the seed under certain circumstances, especially if the moisture content of the seed is over 12 percent, or if the dosage or exposure period is excessive. Exposure periods should not exceed 24 hours. If bulk seed is treated, provision must be made to aerate it after 24 hours unless the fumigant used is known to be harmless under all conditions. Most bulk seed is able to absorb and retain fumigants for long periods. Therefore, unless it is aerated, the exposure period is automatically extended and serious germ injury may result.

Fumigations may be conducted in bins, vaults, or warehouses. For warehouse and vault fumigation hydrogen cyanide, methyl bromide, or chloropicrin can be used at the rate of 1 pound per 1000 cubic feet. No damage to germination need be feared from the use of hydrogen cyanide if the seed is normally dry. Methyl bromide or chloropicrin may be safely used if the moisture content is not over 12 percent, and if fans are employed to keep the vapors from forming layers near the floor. For the treatment of binned seed a 3-to-1 mixture of ethylene dichloride and carbon tetrachloride is recommended, at a dosage of 4 to 5 gallons per 1000 bushels, depending on the tightness of the bin and the type of seed being treated. This mixture does not appear to injure the germination of bulk seed regardless of the seed moisture, the dosage, or the exposure period. Home preparation of this mixture should not be attempted. It may be obtained ready made from manufacturers. Directions for applying these fumigants and precautions to be taken in handling them are given in Circular 369, "Industrial fumigation against insects," and Farmers' Bulletin 1811, "Control of insects attacking grain in farm storage," published by the U. S. Department of Agriculture.

Use of Other Fumigants

NAPHTHALENE and paradichlorobenzene crystals have been used extensively for the protection of seed. Recommended dosages vary greatly. A popular dosage is about 1 ounce per bushel of seed, although much heavier dosages are sometimes recommended. The crystals mixed with the seed give off vapors that are toxic to insects. If the moisture content of the seed is not over 12 percent, little injury to germination need be feared from naphthalene vapors. Paradichlorobenzene vapors, however, cause considerable damage to germination even in very dry seed. Seed treated with either of these chemicals is unfit for animal feeds, since an obnoxious odor and taste is imparted to the flesh of animals and poultry fed treated grain and to the eggs laid by poultry so fed.

Fumigation of Mills

DURING manufacture and processing, dried foods are exposed to infestation by insects that become established in the machinery or in various parts of the mill or manufacturing plant. To prevent such infestation, complete freedom from insects in the processing plant should be sought by means of sanitation; by fumigation of the entire plant two or three times a year with hydrogen cyanide, methyl bromide, or chloropicrin; or by heat sterilization; and by the monthly local fumigation of machinery in which residues of foodstuffs occur. Chloropicrin, hydrogen cyanide, and the 3 to 1 mixture of ethylene dichloride and carbon tetrachloride are used extensively for local fumigation of milling machinery. Methods and dosages are given in Circular 720, "Controlling insects in flour mills," published by the U. S. Department of Agriculture. Some of the newer mixtures that are proving successful for this type of work are carbon tetrachloride with ethylene dibromide, acrylonitrile, or 1,1-dichloro-1-nitroethane.

Fumigation in Warehouses

BAGGED cereal grains, legumes, oil seeds, and other types of foods stored in warehouses should be inspected once a month during periods when the temperature of the product is 70° F. or above. Whenever such commodities are found to be infested, the warehouse should be fumigated. If the warehouse is not tight enough for fumigation, infested products can be removed to a fumigation vault or treated under a gastight tarpaulin.

For warehouses of tight construction fumigation with methyl bromide is recommended at a dosage of 1 to 1½ pounds per 1000 cubic feet. Hydrogen cyanide may also be used at the rate of 1 pound per 1000 cubic feet for such products as bagged corn, rice, chick peas, and beans.

For use in fumigation vaults or under tarpaulins a wide selection of fumigants is available. Dosages, directions for using, and precautions to be taken in handling the various fumigants in mill, warehouse, and vault fumigation may be found in U. S. Department of Agriculture Circulars 369 and 720, and for farm-bin and elevator fumigation in Farmers' Bulletins 1811 and 1880.

Warning to Fumigators

FUMIGANTS are toxic to the person applying them as well as to the insects to be destroyed. They should be handled with all the precautions necessary to prevent exposure to dangerous concentrations, as outlined in the above-mentioned publications. Men trained in the safe and efficient use of fumigants are usually available in all large communities.★★

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Nomenclature

THE development of organic chemicals for plant pest control has created the problem of finding simpler synonyms for chemicals' names.

These are needed to bridge the gap between complicated chemical designations (for example Disodium Ethylene Bisdithiocarbamate) and trade names. They must be acceptable to chemists, enforcement officials, entomologists, phytopathologists, and the industry.

This problem has been under study by an industry committee, and toward its solution the American Association of Economic Entomologists has now recommended the creation of a committee on nomenclature—to comprise representatives of the AAEE, the American Chemical Society, the industry trade associations and the Federal and State enforcement officials.

MODEL INSECTICIDE ACT

Long recognized need for uniform legislation inspires drafting of this new model law . . . its general adoption would assure industry adequate protection from conflicting statutes

A SUGGESTED model State insecticide, fungicide and rodenticide act has been prepared by the Council of State Governments, and released by this body as a pattern to be followed by individual states in drafting new economic poisons laws, or in revising existing acts already on their statute books. The purpose is, of course, to be sure that state measures are adequate to protect the public against misbranded and adulterated products, and to help bring about the establishment of uniformity in federal and state regulations so that manufacturers of the controlled materials will not be unnecessarily handicapped in marketing their products on a national basis, with resulting increased cost to the consumer.

The model act was prepared at the request of the National Association of Commissioners, Secretaries and Directors of Agriculture. Representatives of interested State and Federal agencies and associations of manufacturers of insecticides, fungicides, rodenticides and herbicides cooperated in drafting the provisions as presented herein. The model act in this form has the endorsement of the drafting committee of state officials, of the Council of State Governments, representatives of the Department of Justice who co-operated with the State Officials in preparing uniform legislative measures, and numerous manufacturers and distributors of materials affected by such laws.

Most of the terms of the proposed model state law are self explanatory. However, it might be pointed out that the term "labeling" is used in a broader sense than "label", and includes all written, printed, or graphic matter upon or accompanying an economic poison, or referred to on such a label or in such literature, except "publications of federal or state agencies authorized to conduct research on economic poisons". Also, the word "adulterated" applies to any economic poison if its strength falls below the standard of quality as expressed on the label, or if any substance has been substituted wholly or in part, or if abstracted. "Misbranding" covers false or misleading statements on the label, or imitation of another product. Lack of proper instructions for use of the poison is also considered misbranding, particularly when the wording fails to give adequate protection to the user.

The Council describes the purpose of registration as being "to prevent ineffective, fraudulent, or dangerous economic poisons from being marketed in the state without the knowledge of the Commissioner. Registration is a tool of enforcement." The Council's words in further explaining the details of registration are as follows: "It should be noted that registration cannot be absolutely denied the applicant since under paragraph 'd' of this section it is provided that if the article does not appear to meet the requirements of the Act and the registrant insists that correction is not necessary, the article shall be registered under protest. If the product is later found to be in violation of the Act, a heavier penalty should be provided than would otherwise be the case for a first offense."

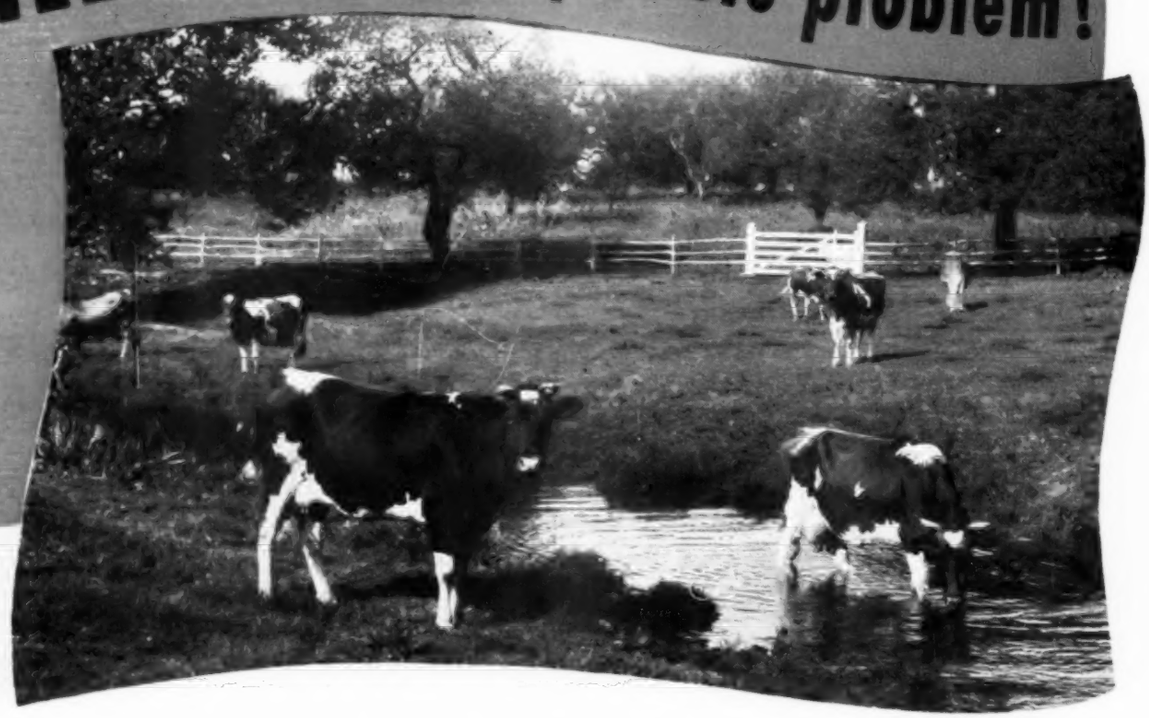
Full text of the proposed Act follows:

Uniform State Insecticide, Fungicide and Rodenticide Act

[Title. It should conform to State requirements. The following is a suggestion; a more complete title should be used where necessary:

"AN ACT relating to the distribution, sale, or transportation of adulterated or misbranded insecticides, fungicides, rodenticides, and other economic poisons [and devices]; regulating traffic therein; providing for registration and examination of such materials, impos-

WEEDS-the No.1 pasture problem!



Baker's 2,4-D

KILLS NOXIOUS PASTURE WEEDS—CUTS WASTE OF FERTILIZER AND LABOR—GIVES MORE GRAZING PER ACRE!

Weeds in pastures take a heavy toll from livestock raisers every year. The total no doubt runs into tens of millions of dollars! Weeds are the livestock man's No. 1 pasture problem!

Weeds crowd out grasses — rob them of essential plant food and moisture. They waste money and time spent on fertilizer and labor. They reduce the grazing capacity of pasture, so that considerably fewer livestock can be carried per acre.

Some weeds, also, act as hosts for insects . . . some poison or injure livestock . . . several taint the flavor of dairy products . . . a good many directly depreciate the value of land.

Killing pasture weeds makes more grass available for livestock—reduces weed-associated losses—increases pasture profits!

Many noxious weeds can be killed with 2,4-D—including such important pasture weeds as ragweed, peppergrass, sunflower, bindweed, Canadian thistle, plantain, burdock, horse nettle, cocklebur, wild carrot, wild onion, dock and leafy spurge, to name but a few.

To those who formulate weed killers, here is a tremendous market!

The J. T. Baker Chemical Company supplies your needs two ways:

Raw materials for manufacturing weed killers such as acid 2,4-D, and the sodium salt of 2,4-D, which is water soluble.

Baker's 2,4-D formulated concentrates, which are ready for dilution by the consumer and ready for your distribution, trademark and label.

Whether you are interested in either or both, write for further facts and prices. Address Organic Chemical Division, J. T. Baker Chemical Co., *Executive Office,* Phillipsburg, N. J.

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

ing penalties, and for other purposes."]

(Be it enacted, etc.)

Section 1. Title. This Act may be cited as the Insecticide, Fungicide, and Rodenticide Act of 1947.

Section 2. Definitions. For the purpose of this Act—

a. The term "economic poison" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, fungi, weeds, or other forms of plant or animal life or viruses, except viruses on or in living man or other animals, which the Commissioner shall declare to be a pest.

[b. The term "device" means any instrument or contrivance intended for trapping, destroying, repelling, or mitigating insects or rodents or destroying, repelling, or mitigating fungi or weeds, or such other pests as may be designated by the Commissioner, but not including equipment used for the application of economic poisons when sold separately therefrom.]

c. The term "insecticide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects which may be present in any environment whatsoever.

d. The term "fungicide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any fungi.

e. The term "rodenticide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating rodents or any other vertebrate animal which the Commissioner shall declare to be a pest.

f. The term "herbicide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any weed.

g. The term "insect" means any of the numerous small invertebrate animals generally having the body more or less obviously segmented, for the most part belonging to the class Insecta, comprising six-legged, usually winged forms, as, for example, beetles, bugs, bees, flies, and to other allied classes of arthropods whose members are wingless and usually have more than six legs, as, for example, spiders, mites, ticks, centipedes, and wood lice.

h. The term "fungi" means all non-chlorophyll-bearing thallophytes (that is, all non-chlorophyll-bearing plants of a lower order than mosses and liverworts) as, for example, rusts, smuts, mildews, molds, yeasts, and bacteria, except those on or in living man or other animals.

i. The term "weed" means any plant which grows where not wanted.

j. The term "ingredient statement" means either—

(1) a statement of the name and percentage of each active ingredient, together with the total percenage of the inert ingredients, in the economic poison; or

(2) a statement of the name of each active ingredient, together with the name of each and total percentage of the inert ingredients, if any there be, in the economic poison (except Option 1 shall apply if the preparation is highly toxic to man, determined as provided in Section 5 of this Act); and, in addition to (1) or (2) in case the economic poison contains arsenic in any form, a statement of the percentages of total and water soluble arsenic, each calculated as elemental arsenic.

k. The term "active ingredient" means any ingredient which will prevent, destroy, repel, or mitigate insects, fungi, rodents, weeds, or other pests.

l. The term "inert ingredient" means an ingredient which is not an active ingredient.

m. The term "antidote" means the most practical immediate treatment in case of poisoning and includes first aid treatment.

n. The term "person" means any individual, partnership, association corporation, or organized group of persons whether incorporated or not.

o. The term "Commissioner" means the [Commissioner, Secretary or Director of Agriculture].[1]

p. The term "registrant" means the person registering any economic poison pursuant to the provisions of this Act.

q. The term "label" means the written, printed, or graphic matter on, or attached to, the economic poison [or device], or the immediate container thereof, and the outside container or wrapper of the retail package, if any there be, of the economic poison [or device].

r. The term "labeling" means all labels and other written, printed, or graphic matter,

(1) upon the economic poison [or device] or any of its containers or wrappers;

(2) accompanying the economic poison [or device] at any time;

(3) to which reference is made on the label or in literature accompanying the economic poison [or device], except when accurate, non-misleading reference is made to current official publications of the United States Departments of Agriculture or Interior, the United States Public Health Service, State Experiment Stations, State Agricultural Colleges, or other similar Federal institutions or official agencies of this State or other States authorized by law to conduct research in the field of economic poisons.

s. The term "adulterated" shall apply to any economic poison if its strength or purity falls below the professed standard or quality as expressed on labeling or under which it is sold, or if any substance has been substituted wholly or in part for the article, or if any valuable constituent of the article has been wholly or in part abstracted.

t. The term "misbranded" shall apply—

(1) to any economic poison [or device] if its labeling bears any statement, design, or graphic representation relative thereto or to its ingredients which is false or misleading in any particular;

(2) to any economic poison—

(a) if it is an imitation of or is offered for sale under the name of another economic poison;

(b) if its labeling bears any reference to registration under this Act;

(c) if the labeling accompanying it does not contain instructions for use which are necessary and, if complied with, adequate for the protection of the public;

(d) if the label does not contain a warning or caution statement which may be necessary and, if complied with, adequate to prevent injury to living man and other vertebrate animals;

(e) if the label does not bear an ingredient statement on that part of the immediate container and on the outside container or wrapper, if there be one, through which the ingredient statement on the immediate container can not be clearly read, of the retail package which is presented or displayed under customary conditions of purchase;

(f) if any word, statement, or other information required by or under the authority of this Act to appear on the labeling is not prominently placed thereon with such conspicuousness (as compared with other words, statements, designs, or graphic matter in the labeling) and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use, or

(g) if in the case of an insecticide, fungicide, or herbicide, when used as directed or in accordance with commonly recognized practice, it shall be injurious to living man or other vertebrate animals or vegetation, except weeds, to which it is applied, or to the person applying such economic poison.

Section 3. Prohibited Acts.

a. It shall be unlawful for any person to distribute, sell, or offer for sale within this State or deliver for transportation or transport in intrastate commerce or between points within this State through any point outside this State any of the following:

(1) Any economic poison which has not been registered pursuant to the provisions of Section 4 of this Act, or any economic poison if any of the claims made for it or any of the directions for its use differ in substance from the representations made in connection with its registration, or if the composition of an economic poison differs from its composition as represented in connection with its registration: Provided, That in the discretion of the Commissioner, a change in the labeling or formula of an economic poison may be made within a registration period without requiring re-registration of the product.

(2) Any economic poison unless it is in the registrant's or the manufacturer's unbroken immediate container, and there is affixed to such container, and to the outside container or wrapper of the retail package, if there be one through which the required information on the immediate container can not be clearly read, a label bearing

(a) the name and address of the manufacturer, registrant, or person for whom manufactured;

(b) the name, brand, or trade mark under which said article is sold; and

(c) the net weight or measure of the content subject, however, to such reasonable variations as the Commissioner may permit

(3) Any economic poison which contains any substance or substances in quantities highly toxic to man, determined as provided in Section 5 of this Act, unless the label shall

[1] In States in which the Act will not be administered by the State Department of Agriculture, the name of the proper official should be inserted.

bear, in addition to any other matter required by this Act,

the skull and crossbones;

(b) the word "poison" prominently, in red, on a background of distinctly contrasting color; and

(c) a statement of an antidote for the economic poison.

(4) The economic poison commonly known as standard lead arsenate, basic lead arsenate, calcium arsenate, magnesium arsenate, zinc arsenate, zinc arsenite, sodium fluoide, sodium fluosilicate, and barium fluosilicate unless they have been distinctly colored or discolored as provided by regulations issued in accordance with this Act, or any other white powder economic poison which the Commissioner, after investigation of and after public hearing on the necessity for such action for the protection of the public health and the feasibility of such coloration or discoloration, shall, by regulation, require to be distinctly colored or discolored; unless it has been so colored or discolored: Provided, That the Commissioner may exempt any economic poison to the extent that it is intended for a particular use or uses from the coloring or discoloring required or authorized by this section if he determines that such coloring or discoloring for such use or uses is not necessary for the protection of the public health.

(5) Any economic poison which is adulterated or misbranded, [or any device which is misbranded].

(b) It shall be unlawful—

(1) for any person to detach, alter, deface, or destroy, in whole or in part, any label or labeling provided for in this Act or regulations promulgated hereunder, or to add any substance to, or take any substance from, an economic poison in a manner that may defeat the purpose of this Act;

(2) for any person to use for his own advantage or to reveal, other than to the Commissioner or proper officials or employees of the State or to the courts of this State in response to a subpoena, or to physicians, or in emergencies to pharmacists and other qualified persons, for use in the preparation of antidotes, any information relative to formulas of products acquired by authority of Section 4 of this Act.

Section 4. Registration.

a. Every economic poison which is distributed, sold, or offered for sale within this State or delivered for transportation or transported in intrastate commerce or between points within this State through any point outside this State shall be registered in the office of the Commissioner, and such registration shall be renewed annually; Provided, That products which have the same formula, are manufactured by the same person, the labeling of which contains the same claims, and the labels of which bear a designation identifying the product as the same economic poison may be registered as a single economic poison; and additional names and labels shall be added by supplement statements during the current period of registration; and Provided, further, That any economic poison imported into this State, which is subject to the provisions of any Federal Act providing for the registration of economic poisons and which has been duly registered under the provisions of said Act, may, in the discretion of the Commissioner, be exempted from registration under this Act, when sold or distributed in the unbroken immediate container in which it was originally shipped. The registrant shall file with Commissioner a statement including

(1) the name and address of the registrant and the name and address of the person whose name will appear on the label, if other than the registrant;

(2) the name of the economic poison;

(3) a complete copy of the labeling accompanying the economic poison and a statement of all claims to be made for it including directions for use; and

(4) if requested by the Commissioner a full description of the tests made and the results thereof upon which the claims are based. In the case of renewal of registration, a statement shall be required only with respect to information which is different from that furnished when the economic poison was registered or last reregistered.

b. The registrant shall pay an annual fee of $———— for each economic poison registered, such fee to be deposited [in the Treasury of the State] [to the credit of a special fund to be used only for carrying out the provisions of this Act]: Provided, however, That any registrant may register annually any number of brands after the payment of annual fees aggregating $————.

c. The Commissioner, whenever he deems it necessary in the administration of this Act, may require the submission of the complete formula of any economic poison. If it appears to the Commissioner that the composition of the article is such as to warrant the proposed claims for it and if the article and its labeling and other material required to be submitted comply with the requirements of Section 3 of this Act, he shall register the article.

d. If it does not appear to the Commissioner that the article is such as to warrant the proposed claims for it or if the article and its labeling and other material required to be submitted do not comply with the provisions of this Act, he shall notify the registrant of the manner in which the article, labeling, or other material required to be submitted fail to comply with the Act so as to afford the registrant an opportunity to make the necessary corrections. If, upon receipt of such notice, the registrant insists that such corrections are not necessary and requests in writing that the article be registered, the Commissioner shall register the article, under protest, and such registration shall be accompanied by a warning, in writing, to the registrant of the apparent failure of the article to comply with the provisions of this Act. In order to protect the public, the Commissioner, on his own motion, may at any time, cancel the registration of an economic poison and in lieu thereof issue a registration under protest in accordance with the foregoing procedure. In no event shall registration of an article, whether or not protested, be construed as a defense for the commission of any offense prohibited under Section 3 of this Act.

e. Notwithstanding any other provision of this Act, registration is not required in the case of an economic poison shipped from one plant within this State to another plant within this State operated by the same person.

Section 5. Determination; Rules and Regulations; Uniformity.

a. The Commissioner is authorized, after opportunity for a hearing

(1) to declare as a pest any form of plant or animal life or virus which is injurious to plants, men, domestic animals, articles, or substances;

(2) to determine whether economic poisons are highly toxic to man; and

(3) to determine standards of coloring or discoloring for economic poisons, and to subject economic poisons to the requirements of Section 3 a (4) of this Act.

b. The Commissioner is authorized, after due public hearing, to make appropriate rules and regulations for carrying out the provisions of this Act, including rules and regulations providing for the collection and examination of samples of economic poisons [or devices].

c. In order to avoid confusion endangering the public health, resulting from diverse requirements, particularly as to the labeling and coloring of economic poisons, and to avoid increased costs to the people of this State due to the necessity of complying with such diverse requirements in the manufacture and sale of such poisons, it is desirable that there should be uniformity between the requirements of the several States and the Federal Government relating to such poisons. To this end the Commissioner is authorized, after due public hearing, to adopt by regulation such regulations, applicable to and in conformity with the primary standards established by this Act, as have been or may be prescribed by the United States Department of Agriculture with respect to economic poisons.

Section 6. Enforcement.

a. The examination of economic poisons [or devices] shall be made under the direction of the Commissioner for the purpose of determining whether they comply with the requirements of this Act. If it shall appear from such examination that an economic poison [or device] fails to comply with the provisions of this Act, and the Commissioner contemplates instituting criminal proceedings against any person, the Commissioner shall cause approriate notice to be given to such person. Any person so notified shall be given an oppertunity to present his views, either orally or in writing, with regard to such contemplated proceedings and if thereafter in the opinion of the Commissioner it shall appear that the provisions of the Act have been violated by such person, then the Commissioner shall refer the facts to the [District Attorney] for the county in which the violation shall have occurred with a copy of the results of the analysis or the examination of such article: Provided, however, That nothing in this Act shall be construed as requiring the Commissioner to report for prosecution or for the institution of libel proceedings minor violations of the Act whenever he believes that the public interests will be best served by a suitable notice of warning in writing.

b. It shall be the duty of each [District Attorney] to whom any such violation is reported to cause appropriate proceedings to be instituted and prosecuted in the ..... Court without delay.

c. The Commissioner shall, by publication in such manner as he may prescribe, give notice of all judgments entered in actions instituted under the authority of this Act.

Section 7. Exemptions.

a. The penalties provided for violations of Section 3a of this Act shall not apply to—

(1) any carrier while lawfully engaged in transporting an economic poison within this State, if such carrier shall, upon request, permit the Commissioner or his designated agent to copy all records showing the transactions in and movement of the articles;

(2) public officials of this State and the Federal Government engaged in the performance of their official duties;

(3) the manufacturer or shipper of an economic poison for experimental use only

(a) by or under the supervision of an agency of this State or of the Federal Government authorized by law to conduct research in the field of economic poisons, or

(b) by others if the economic poison is not sold and if the container thereof is plainly and conspicuously marked "For experimental use only—Not to be sold," together with the manufacturer's name and address: Provided, however, That if a written permit has been obtained from the Commissioner, economic poisons may be sold for experiment purposes subject to such restrictions and conditions as may be set forth in the permit.

b. No article shall be deemed in violation of this Act when intended solely for export to a foreign country, and when prepared or packed according to the specifications or directions of the purchaser. If not so exported all the provisions of this Act shall apply.

Section 8. Penalties.

a. Any person violating Section 3a (1) of this Act shall be guilty of a misdemeanor and upon conviction shall be fined not more than $.....

b. Any person violating any provision of this Act other than Section 3a (1) shall be guilty of a misdemeanor and upon conviction shall be fined not more than $..... for the first offense and upon conviction for a subsequent offense shall be fined not more than $.....: Provided, That any offense committed more than five years after a previous conviction shall be considered a first offense; and Provided, further, That in any case where a registrant was issued a warning by the Commissioner pursuant to the provisions of this Act, such registrant shall upon conviction of a violation of any provision of this Act other than Section 3a (1) be fined not more than $....., or imprisoned for not more than one year, or be subject to both such fine and imprisonment; and the registration of the article with reference to which the violation occurred shall terminate automatically. An article the registration of which has been terminated may not again be registered unless the article, its labeling, and other material required to be submitted appear to the Commissioner to comply with all the requirements of this Act.

c. Notwithstanding any other provisions of this section, in case any person, with intent to defraud, uses or reveals information relative to formulas of products acquired under authority of Section 4 of this Act, he shall be fined not more than $..... or imprisoned for not more than one year, or both.

Section 9. Seizures.

a. Any economic poison [or device] that is distributed, sold, or offered for sale within this State or delivered for transportation or transported in intrastate commerce or between points within this State through any point outside this State shall be liable to be proceeded against in any ..... Court in any county of the State where it may be found and seized for confiscation by process of libel for condemnation:

(1) in the case of an economic poison,

(a) if it is adulterated or misbranded;

(b) if it has not been registered under the provisions of Section 4 of this Act;

(c) if it fails to bear on its label the information required by this Act;

(d) if it is a white powder economic poison and is not colored as required under this Act.

[(2) In the case of a device, if it is misbranded].

b. If the article is condemned, it shall, after entry of decree, be disposed of by destruction or sale as the court may direct and the proceeds, if such article is sold, less legal costs, shall be paid to the State Treasurer: Provided, That the article shall not be sold contrary to the provisions of this Act; and Provided, further, That upon payment of costs and execution and delivery of a good and sufficient bond conditioned that the article shall not be disposed of unlawfully, the court may direct that said article be delivered to the owner thereof for relabeling or reprocessing as the case may be.

c. When a decree of condemnation is entered against the article, court costs and fees and storage and other proper expenses shall be awarded against the person, if any, intervening as claimant of the article.

Section 10. Delegation of Duties. All authority vested in the Commissioner by virtue of the provisions of this Act may with like force and effect be executed by such employees of the [Department of Agriculture] as the Commissioner may from time to time designate for said purpose.

Section 11. Cooperation. The Commissioner is authorized and empowered to cooperate with, and enter into agreements with, any other agency of this State, the United States Department of Agriculture, and any other State or agency thereof for the purpose of carrying out the provisions of this Act and securing uniformity of regulations.

Section 12. Separability. If any provision of this Act is declared unconstitutional, or the applicability thereof to any person or circumstance is held invalid, the constitutionality of the remainder of this Act and the applicability thereof to other persons and circumstances shall not be affected thereby.

Section 13. Effective Date. All provisions of this Act, except Section 3, "prohibited acts"; Section 8 "penalties"; and Section 9 "seizures", shall take effect upon enactment, and Sections 3, 8, and 9, shall take effect as follows:

[(1) as to devices, upon enactment;]

(2) as to rodenticides and herbicides, 6 months after enactment; and

(3) as to insecticides, fungicides, and all other economic poisons, one year after enactment.[2]

Section 14. Repeals. Jurisdiction in all matters pertaining to the distribution, sale and transportation of economic poisons [and devices], is by this Act vested exclusively in the Commissioner, and all acts and parts of acts inconsistent with this Act are hereby expressly repealed.

ITALY

(*Continued from Page* 21)

size was more battle-scarred than that between Naples and Rome a week after the Armies passed through, and the wheat was dead-ripe all the way. Two weeks later much of it was harvested—not all, for few of the workers had been there when the mines were sown in the same fields, and the casualties were very heavy. But the crops that were produced there the next year were a tribute to the momentum of agriculture when faced with the most intensive interference from war, mining, flooding, and destruction of all kinds.

In other areas, survey trips almost always revealed problems urgently needing attention, but showed also cases where the land was seeded despite the lack of supplies in usual channels, tended despite the lack of draft power and fertilizer, and harvested without repair parts for binders, etc.—usually producing 50 percent or more. Normal yields cannot be achieved under those conditions, but remarkable self-sufficiency, for the farmers and the small villages, was characteristic. The great abundance of hand labor, and the great number of people that had some interest in a little land, kept agriculture going when industry stood idle for months and years—and the record of production would have been very much greater if the 1945 and 1946 growing seasons had been as favorable as 1944.

Chemical Reduction

The effect of intensive agriculture to sustain maximum production actually obscured much of the hardship that resulted from the war, or deferred it to the future. In the two years, 1944 and 1945, the land, in the aggregate, received roughly 5% of the normal amount of acid phosphate,

[2] The provisions of Section 13 as to the effective dates of this Act are merely suggestive.

10% of the nitrogen, 16% of the copper fungicides, 30% of the sulfur, a full quantity of basic insecticides by pre-war standards, and no potash at all. (Half the nitrogen, all the copper, and essentially all the insecticides were imported, as was the rock phosphate.) Yet the 1944 crop was large, fully normal for cereals, and the 1945 crop was cut far more by drought than from other factors—reflecting the basic productivity of Italian agriculture. Secondary food crops, industrial crops, forage—all these were reduced in the same period, but most of the yield was produced by intensive soil-depleting methods.

The futility that one sees in short-range, emergency agricultural programs is possibly better termed a feeling of humility. Nature, and that includes human nature, enters in to frustrate many emergency programs, or to expand their return unbelievably. So it was in this operation, experience and training taught the group where to anticipate trouble, and where to contribute assistance and supplies. Great contributions by Italian agriculture to the war effort, were recorded. Specific programs were carried to completion to provide food, forage, and fibre for combat requirements, the tonnage of which was many times that of the tonnage of all imported supplies. Nevertheless, it would be unfair to Italian agriculture as a whole, if it were said that the stimulus given to it, in the course of war—and post-war utilization of it—was more than incidental, in such an intensive, populous area. Phases irrelevant to the immediate subject, such as prices paid, industrial goods available, governmental controls—all these tended to underscore the complexity of the total picture, and its limited susceptibility to "control."

A report on any phase of agriculture in the wake-of-battle period would be incomplete without at least a paragraph on the rebuilding of the administrative organization. The Italian Ministry of Agriculture was rebuilt (5) completely, out of remnants which deserve great credit for their record of devotion and ability without political entanglements. Likewise all the organizations of major importance in agriculture, public and private, underwent radical changes. In several outstanding instances there was enough key "career" personnel, who survived the close scrutiny of post-war Italy, to operate successfully even in the most difficult times. This was possibly the most-discussed thing about Military Government operations—but, from an agricultural standpoint at least, we found no choice but to rely on men who knew their work. Hence, the responsibility for preparing and executing the programs to guide and supply the needs of agriculture fell on the shoulders of the trained and experienced Italians who had been in that work all their lives. Their co-operation, almost without exception, was wholehearted—their aim was to let agriculture do its best to repair the damage of war.★★

FOOTNOTES

(1) Over fifty officer and civilian specialists were assigned to the Agriculture Sub-Commission at various times, the staff usually totaling about twenty at any time. Despite the "turnover," their efforts combined to achieve a commendable over-all record of performance—full credit to each is due, although the "teamwork" of the group precludes mention of individuals.

(2) Italian agricultural statistics were often questioned, but when the accumulated sales records of the Federazione dei Consorzi Agrari were available, they were found to be consistent with those of the Ministry of Agriculture and the Central Institute of Statistics. Since the sales records were most detailed, and readily available, they formed a dependable basis for screening the requirements, especially of agricultural chemicals. Only the "expert opinions" were found to fluctuate widely, with the weather and current events.

(3) In this, credit is due Mr. Elder, sent to Italy in 1943, and subsequently, to assist in the program for supplying seed potatoes from the U.S. His first-hand knowledge of the situation circumvented many of the normal delays in programming shipments of materials, and was responsible for the timely arrival of copper sulfate in this instance.

(4) A famous trouble-shooter on the first-phase problems was Stanley Andrews, editor of the Arkansas Farmer, then a Lt. Colonel, who saw more front-line Communes than most. He finally developed an amazing repertory of examples of agriculture picking up the pieces and getting back to work.

(5) The rebuilding of the Ministry was guided first by a fine administrator, Scottish Lt. Col. M. A. M. Dickie, who unraveled much of the bureaucracy of the Italian system. Ministry operations were later developed by Mr. L. G. Allbaugh, well versed in the fundamentals of the Extension Service in the U.S.—finally resulting in some meetings unique in the history of Italy, as the new organization got underway.

Fertilizer Outlook

THERE is urgent need that the production capacity of the U. S. for high-analysis phosphates be increased. Neil Bass, chief conservation engineer of the Tennessee Valley Authority, declared in an address at the Illinois Agricultural Association's annual convention in Chicago, November 20.

The United States is presently facing the most acute fertilizer shortage in its history, Mr. Bass aserted. Farmers in all parts of the country, he said, are unable to get quantities needed and which they are ready to buy. Shortages, he added, are particularly acute in phosphate and most severe in the middle west, where the supply problem is difficult, due to distance from raw material sources and fertilizer producing points.

The U. S. Dept. of Agriculture, Bass stated, is recommending that annual consumption of phosphate pentoxide (P_2O_5) or "available phosphoric acid" for fertilizer purposes in the corn belt, northern plains and lakes states be increased to 1,025,000 tons, as compared to 297,000 tons in this area in 1944. Other authorities, he added, recommend an even greater increase.

This country's deposits of phosphate rock, as outlined by the speaker, are located in three principal areas: 78 percent in Montana, Idaho, Wyoming and Utah; 20 percent in Florida and 2 percent in Tennessee. The western deposits, while far the largest, are located principally in the public domain, he continued, and because of inaccessibility and distance from major consuming areas, have been exploited only slightly.

Florida's deposits constitute the major convenient source of phosphate rock, and, he declared, justify much more extensive development than presently exists. In the Tennessee fields, he asserted, the amount of phosphate was relatively small to begin with. After many years of mining, this deposit is almost depleted and now has a prospective life estimated in the neighborhood of 60 years, he said.

"However," he said, "present manufacturing techniques utilize only the brown phosphate rock which will have a life of about 30 years at the present rate of use. It is clear, therefore, that the Tennessee reserves cannot, in the long run, be drawn upon heavily to meet the increasing requirements for maintenance of soil fertility.

There is also need for conserving the Tennessee deposit against possible future war demands and T.V.A. is taking steps to withdraw from production a substantial portion of the reserves it has acquired in the Tennessee fields.

"All these considerations point to the necessity of increasing peacetime use of the Florida deposits by interior producers and the opening up of the western deposits for use in commercial fertilizer production."

Since phosphate rock reserves are at long distances from our principal agricultural areas, freight and handling have become a significant factor in the cost to the farmer. T.V.A., he said, has thus directed its research to the objective of making concentrated high-analysis materials and has perfected processes for making high-strength phosphoric acid by use of the electric furnace. The triple-strength superphosphate containing 45 to 48 percent available P_2O_5 made by this method is widely known and by additional kiln drying, the concentration can be stepped up to possibly 54 per cent, he explained.

In addition to the electric furnace, Bass said, T.V.A. has perfected the design (based on pilot plant operations) for a plant to produce high-analysis phosphate fertilizer by a novel type blast furnace. This process, he said, would be used in the new plant proposed for Mobile, Alabama.

Fertilizer from Sludge

A new manual, "Utilization of Sewage Sludge as Fertilizer" has been released to its members by the Federation of Sewage Works Associations. The book is a 120-page treatise presenting an evaluation of advantages and limitations of sewage sludge as a soil conditioner for agricultural purposes. Parts of the book include the fertilizer requirement of soils, fertilizer characteristics of sewer sludge, processing sludge for use as fertilizer, application of sludge as fertilizer, hygienic aspects, prices, marketing, and economic considerations involved in the use of sludge for such purposes.

Copies of the book are available at the headquarters of the Federation of Sewage Works Association, 325 Illinois Bldg., Champaign, Ill. The price to non-members of the association is listed as $1.25; members, 75c.

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Joins Plant Food Council

Appointment of Cedric G. Gran, formerly head of the Agricultural Chemicals Section of OPA, as Assistant to the President of the American Plant Food Council, was recently announced by the Council. Mr. Gran served on the Washington staff of OPA from November 1941 to November 1946 administering price ceilings on fertilizers, fertilizer raw materials, agricultural lining materials, insecticides and fungicides. His previous experience included four years as managing director of Shenandoah Valley, Inc., a regional Chamber of Commerce at Staunton, Va.; seven years as advertising manager for the Virginia-Carolina Chemical Corp., at Richmond, Va. and four years as assistant to the president of Pin Money Brands, Inc., a Richmond food concern. He is a graduate of De Pauw University.

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Indiana Federation Meets

Indiana Farm Bureau Federation, at its annual convention in Indianapolis in November, adopted a resolution recommending expansion of fertilizer production by the industry generally including the farmer cooperatives.

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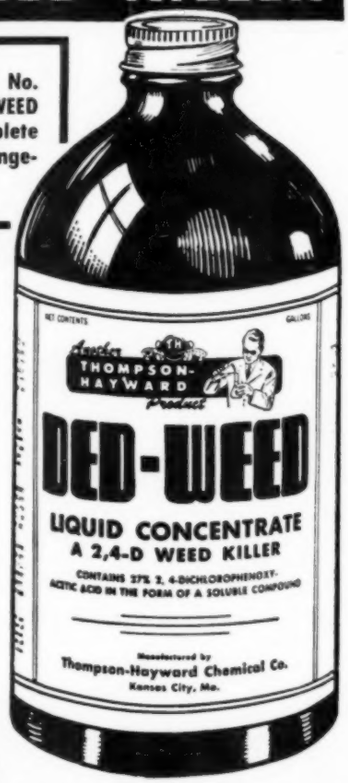

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Plant Disease Experts Discuss Fungicides

PLANT disease experts from all sections of the United States and from various parts of the world were in attendance at the thirty-eighth annual meeting of the American Phytopathological Society held in Cincinnati December 28, 29 and 30. More than 100 papers were presented during the three-day session.

New officers were named at the Sunday evening banquet. Dr. A. J. Riker of Wisconsin, is the new president, succeeding Dr. J. H. Craigie of Ottawa, Canada; Vice-President is Dr. R. S. Kirby of Pennsylvania, replacing Dr. Riker; Dr. J. H. Jensen of North Carolina is a new councilor. Dr. E. M. Johnson of Kentucky remains another year as secretary, and Dr. M. C. Richards of New Hampshire is the new treasurer, succeeding Dr. R. M. Caldwell of Purdue University. Dr. Helen Hart of Minnesota remains editor-in-chief of the Society's publication, *Phytopathology*.

Urgent need for education for dealers in and users of fungicides and all other new chemical products for agriculture was stressed by K. Starr Chester, of Stillwater, Oklahoma, chairman of the Society's publicity committee, in his talk Saturday night. He pointed out how farmers in general must rely upon dealers for most of the information they have, and in many cases the dealer himself does not possess proper knowledge of how to use various materials he sells. Dr. Starr pointed out how such ignorance can lead to errors in application, with the resulting unfortunate results being blamed upon the product, the manufacturer, or both. The research worker who does know how to use complicated chemical preparations is for some reason out of the main channel of circulation, and the value of his experience is largely wasted unless some means is found to impart this knowledge where it is needed most. Dr. Chester then pointed out a number of desirable media which not only would accept such material, but are eager to publish it.

Papers discussing many phases of phytopathological endeavor were presented during the full three days of meetings. The sessions featured general subjects such as the physiology of fungi and antibiotics; fruit diseases, Dutch Elm disease, virus diseases, field crop diseases, vegetable diseases, fungicides, fungous diseases, and breeding for resistance. Symposiums were held on fungicides, tomato and potato late blight, and a conference of extension workers brought out the problems connected with plant disease reporting and forecasting on a large scale.

In order to promote greater efficiency and coordination, the So-

Below: Some of newly-elected officers of American Phytopathological Society at Cincinnati: Front row, (L to R) Dr. Helen Hart, Editor, PHYTOPATHOLOGY; Dr. A. J. Riker, president of the Society; Dr. E. M. Johnson, secretary; Dr. M. C. Richards, treasurer. Back row: Dr. L. J. Alexander, business manager of PHYTOPATHOLOGY; Dr. J. S. Jensen, councilor.

ciety's four separate fungicide committees were combined under one over-all "Fungicide Committee." Chairman of this new group is Dr. S. E. A. McCallan, and committeemen include Drs. J. G. Horsfall, M. B. Moore, H. W. Thurston and J. D. Wilson. Dr. Horsfall heads a new subcommittee on Special Problems. This group will consider such matters as dealer-grower relationships, codification of information on fungicide chemicals, approval for proprietary fungicides, common names of fungicides, and the annual industrial fungicides colloquium. The subcommittee on Seed Treatments is headed by M. B. Moore, and that on Dusts and Sprays by Dr. J. D. Wilson. The new committee on Methods, headed by Dr. H. W. Thurston, replaces the former committee on Standardization of Fungicidal Tests.

In a business meeting on Monday afternoon, the Society went on record as favoring new proposed federal and state insecticide and fungicide legislation for uniformity in legislation governing economic poisons. In a previous gathering earlier in the convention, Dr. Frank L. Howard of Rhode Island took a straw vote regarding the proposed legislation, and received a unanimous show of hands approving the bill.

Dr. L. Gordon Utter of Phelps-Dodge Corp., New York, in speaking on the need for dealer information on fungicides, stated that real teamwork between the experiment station, industry, dealer and grower will result in an all-around improvement of disease control. He mentioned as a good approach to the problem, gatherings of industry and educators of the type held at Cornell University each year. Here frank and open discussions are held, with no pressure being brought to bear in using brand names any more than is necessary. Broad terms of description give the proper information without unduly boosting any particular brand product. Such discussions give new slants on problems which might otherwise require two or more years to solve, he said.

Part of group attending Cincinnati meeting. (L to R) Paul R. Miller, Plant Disease Survey; Dr. E. L. Waldee, Logan, Utah; Dr. L. Gordon Utter, New York; Dr. S. E. A. McCallan, Yonkers, N. Y.; Kenneth Nolan, Stamford, Conn.; and Dr. J. D. Wilson, Wooster, Ohio.

The 1946 late blight of tomatoes was discussed at length in a number of sessions. In a symposium on the subject, Dr. E. K. Vaughan of Georgia, traced the course of the blight from its point of origin in Florida, through its spread in northern states after traveling up the Atlantic coast. He stated that Florida investigations in May showed no trace of blight, but when the rainy period came, the disease developed unexpectedly. Heretofore it had been necessary for tomato growers to spray only for lesser diseases such as early blight. The advice given growers in the southern blight area is to "do the best job of spraying and dusting ever," Dr. Vaughan said. Less than 100 per cent control will not be satisfactory, he said, although it was conceded that chances for such control are slight in years when rainfall and cool weather provide favorable conditions for the disease. He mentioned in passing that investigations have indicated that plant nutrition has a bearing on the resistance or susceptibility of tomatoes to disease. The greater the supply of plant food available, the more resistance the plant has for disease.

Dr. J. D. Wilson of the Ohio Experiment Station presented a paper on late blight, giving recommendations for spraying schedules in control of late blight. He explained that "Zerlate" has been found effective for use against anthracnose and leaf mold, and equally effective against early blight as are the fixed coppers or Bordeaux. It is not nearly as effective against late blight as the fixed coppers, Bordeaux or "Dithane," however, but it will hold late blight in check long enough to give an opportunity to apply coppers or "Dithane." In view of these findings, the following schedules were recommended for control of the four or five major leaf diseases:

Schedule 1.—A straight "Zerlate" schedule unless late blight or Septoria threaten and then if they do, switch to coppers (or "Dithane").

Schedule 2.—An alternate schedule of about three "Zerlate" and two copper sprays.

In both of these schedules spraying should start about 30 days after the first cluster bloom and continue thereafter at approximately 10-day intervals depending on weather conditions. If late blight threatens applications should start earlier, using the coppers. With the "Zerlate,"

(*Turn to Page* 50C)

Comments....

By Dr. Alvin J. Cox

This column by Dr. Cox will appear from time to time as a feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief of the Bureau of Chemistry, California State Dept. of Agriculture in 1932 and retired in 1945.

FEW of us pause to think of our complicated civilization and its background. What does scientific development and government control mean to us, and how would we get along without them? We now realize a little of what it means to us, when one cannot buy everything he wants at will. How would one survive on an uninhabited, isolated island?

When I went to the Philippine Islands over 40 years ago as physical chemist of the Government of the Philippine Islands, one of my jobs was to help in the preparation of an adequate weights and measures law. By investigation we learned that Spanish, Metric and American systems all were used, and often interchangeably to the manipulator's advantage.

One Province advised, "We have no system of weights and measures. We have in use only two measures: the 5-gallon kerosene can and the square gin bottle from Manila. Twenty gin bottles equal one kerosene can." Distance was quite often measured in terms of the number of cigarettes one could smoke while walking from one place to another.

The metric system was basically adopted, and the equivalency established of certain much used standards of measure, such as the *chupa*, *ganta*, *arroba*, and *cavan*, respectively 375 cubic centimeters, 3 liters, 16 liters, and 75 liters. Rice was sold more frequently by measure than by weight. The English system was used to accommodate and describe manufactured products, for example, one purchased five meters of one inch by 12 inch board, or one meter of 30 inch cloth.

In the Bureau of Science vault we had preserved a kilogram weight and a meter rod, primary standards of platinum and irridium compared with the World's official metric standards of weight and measure kept in Paris, France, but at first we had no means by which closely to check with other measures of length in use throughout the Islands with the standard meter. Now a skilled operator in a properly equipped laboratory can determine a given length in terms of light waves, which is as accurate as direct comparison.

After the law was passed, it went into effect in one Province before another. Price haggling was a common characteristic. The unsophisticated natives carried their produce over the mountain to another Province and sold it at a reputedly greater price per unit, for they could not figure that they actually received less in total on account of short weights and measures. Even when the law was in effect, many tienda (store) keepers would use a slightly curved stick to scrape off measures of rice, curve up when buying and curve down when selling.

It fell to my lot to prepare 33 sets of secondary standards of weights and of measures of length and volume for a sealer in each principal province. We constructed a new comparator, a description of which was published, *Philippine Journal of Science* (1907) Volume II, No. 2, Sec. A, May, in which the errors of observation were reduced to a minimum and which was satisfactorily used in preparing a great many provincial and other secondary standards. Imagine my chagrin on one occasion when I found my laboriously and carefully standardized metal containers each with a punched hole in order for the set to be hung on the wall of the provincial building as an exhibit. In another instance when I saw the provincial standard weights were very bright and probably correspondingly inaccurate. I asked the person in charge if he kept them polished, to which he answered, "Oh, yes Sir, every day."

The United States has come a long way by having fixed prices and general standardization. The haggling going on now in America and the international tension, remind me of the futility and waste of time shown by primitive peoples. We should not be smug about our civilization, but by hard work and concientiousness should continue to put our country and ourselves ahead with peace of mind and without disappointment. Let us tart the New Year with continuous humidity, magnanimity, mutual ous humility, magnanimity, mutual understanding, appreciation and cooperation, and devote ourselves to enduring undertakings. The 365 days ahead will largely determine our New Year arrives.★★

The Listening Post

This department, which reviews current plant disease and insect control problems, is a monthly feature of AGRICULTURAL CHEMICALS. The following comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey. The following summary of their most recent reports was prepared especially for this magazine.

By Paul R. Miller

ACCORDING to M. C. Richards black rot caused by *Guignardia bidwellii* is the most serious disease occurring on cultivated grape varieties in New Hampshire. The grapes on unsprayed vines in home gardens are often a total loss as a result of this disease. The standard spray recommendation for its control is two or more applications of Bordeaux mixture during the season. At times a sticker is used with the Bordeau mixture and an insecticide included for insect control.

During the 1946 growing season four materials were applied on the grape variety test block at the Horticultural farm at Durham. These were: Bordeaux mixture 6-6-100; "Fermate" (ferric dimethyldithiocarbamate) 2:100; "Zerlate" (zinc dimethyldithiocarbamate) 2:100; and "Phygon" (2, 3, dichlor-1, 4- naphthoquinone) 1:100. Spray applications were made on June 22, July 16, and August 19. The sprays were applied at 250-300 lbs. pressure with a three-nozzle boom. A 50 percent wettable DDT. (1-100) was added to each of the four materials in the first two spray applications.

Data taken on August 27 showed that all of the combinations used had given good control of black rot on the foliage. The fruits, however, showed from a trace to severe rotting, indicating that a sticker will have to be used with each of the four fungicides in order to obtain disease control on the fruits. In the case of "Phygon" slight to severe flecking of the fruits occurred, showing that this material cannot be used at 1:100 concentration on grapes. The flecking occurred on all of the seven varieties to which "Phygon" was applied.

G. R. Townsend reports late blight (*Phytophthora infestans*) of potatoes has been observed in the fall crop in the Everglades some five or six weeks earlier this year than any previous year. It was first noted on October 22, when scattering lesions were found in a field planted with Bliss Triumph potatoes grown from a Tennessee seed stock. Shortly thereafter it was found in two other fields planted with Tennessee seeds, and subsequently in potatoes from North and South Dakota stocks. It has also been found on volunteer potatoes growing from tubers of the spring crop that had remained in the field over-summer. The disease was well advanced on these volunteer potatoes as early as October 24, and appeared to be spreading from them to a nearby planted field of potatoes. This is my first positive identification of volunteer potatoes as carriers of the late blight disease through the summer in southern Florida, and it may be of importance in explaining the source of the 1945-46 outbreaks on tomatoes and potatoes in this area.

It is of further interest that the disease first appeared when the temperatures were somewhat above the range where late blight would be expected, and there had been little rain for three weeks. Since the first observation, the disease has developed destructively in a field where the spray program was faulty, and threatens to reach serious proportions in other fields that are inadequately sprayed. Recent weather has been very favorable for a serious outbreak in this area, and the possibility should be of concern to other parts of Florida where tomatoes and potatoes are being grown as winter crops.

Under the direction of the Virginia Extension Pathologist, fifty demonstrations in five counties were set up using seed of the Giant Stringless Green Pod, Bountiful, Black

(*Turn to Page* 61)

Insect Conditions in November, December

This column is prepared especially for readers of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U.S.D.A. His observations, based on latest reports received by the Bureau from collaborators all over the country, is a monthly feature of AGRICULTURAL CHEMICALS.

By G. J. Haeussler

INFORMATION has continued to become available during the winter months regarding infestations of insects affecting vegetable and truck crops in the southern areas. The more important developments reported for the period from November 15 to December 15 were as follows:

Cabbage caterpillars continue to occur in moderate to heavy populations on cabbage and other cole crops in parts of South Carolina, Georgia, Florida, Alabama and Louisiana, especially on plantings that have not received adequate insecticide applications. Light populations of these pests were reported from Maryland the last week of November, and from southern Arizona and southern California into the first half of December.

Cutworms were reported causing unusually severe damage to cabbage and celery plantings in some parts of Florida during the last half of November, and some injury during early December. Infestations of the Hawaiian beet webworm continued to damage beet plantings in the Charleston district of South Carolina throughout November and a light

infestation on spinach was reported there during the first week of December.

The southern green stinkbug was reported attacking cabbage and collards in the Charleston district during the last half of November and appeared in light to moderate abundance there on turnips in early December. The insect caused some damage to collards, turnips, okra and tomato in parts of Florida in late November, and continued to occur in most collard plantings in Georgia throughout the first half of December.

Banded and spotted cucumber beetles were numerous on cabbage, squash, and other vegetables in Georgia during the last half of November and were reported causing some injury to turnip plantings there in early December. They caused some damage to the younger plantings of collards in the northwestern sections of Florida late in November. The banded cucumber beetle injured cabbage considerably in Louisiana in November and cucumber beetles were reported causing injury to turnip and other hardy vegetable crops in the southern sections of Alabama up to the middle of December.

In late November, small larvae of the vegetable weevil were reported causing severe injury to turnips in home gardens in Houston County, Alabama, but up to the middle of December no harmful infestations had been observed in commercial plantings there. In early December, this insect was also reported causing light to heavy injury to turnips in Georgia, Florida, South Carolina, and Louisiana, and considerable injury to mustard in the latter state.

Mexican bean beetles continued to occur in small numbers in bean fields in the extreme southern districts until about the end of November, but no reports of their activities were received thereafter. Light injury by the bean leaf roller continued to occur in some bean fields in Florida throughout the first half of December. The serpentine leaf miner caused considerable injury to beans in Manatee County, Florida during early December.

Aphids have continued to occur in light to heavy populations on cabbage and related crops in South Carolina, Georgia, Florida, Alabama, Louisiana and California. The cabbage aphid was numerous in scattered infestations in broccoli fields in southern California during early December. It was reported that these aphids on broccoli were kept under control by the use of hexaethyl tetraphosphate dust when nicotine was not available. Heavy aphid infestations developed in the cauliflower fields of southern California in December.

Aphids, principally the melon aphid and green peach aphid, have continued to cause severe damage to various vegetable crops in Florida, including cucumber, eggplant, celery, and potato. The situation with regard to Irish potato plantings in some areas of the state was reported unusually serious toward the middle of December. ★★

2, 4-D Dosages Recommended at Meeting of North Central Conference in Des Moines

THE North Central Weed Control Conference met in the Savery Hotel, Des Moines, Iowa, December 11, 12, and 13. New officers were elected, and the group presented tentative reports on new herbicides, some aspects of which tend to revise earlier thought on the subject. The policy committee, in presenting the report, emphasizes that its recommendations are entirely tentative, that they apply only to the year 1947, and that they are subject to complete review and change later.

Among the tentative declarations, the Conference states that 2, 4-D may be used to advantage in control of broadleaved weeds in lawns and turfed areas generally, with caution required on bentgrass and buffalo grass; that it may also control and "perhaps ultimately eradicate" a large variety of broadleaved weeds and many woody plants from ditch banks, right-of-ways, fence rows, and stony places where plowing is difficult; and that it may be used on perennial weeds in pastures (where legumes are not an important component), for the prevention of seed production of some annuals. It is pointed out that usually, more than one application of 2, 4-D is required in killing all perennial weeds in an area. However, it is observed further that "it is an advantage of 2, 4-D that these treatments can be applied at less cost and with less interruption of the productive use of the land than with any other chemical weed killer now in wide use."

Recommendations of other weed killers by the Conference include the following statements: Sodium chlorate is approved for the control of small areas of perennial weeds. Borax is approved as an effective herbicide for the control of certain perennial weeds such as leafy spurge and dodbane. Ammonium sulfamate is approved for the control of poison ivy, poison sumac and other woody weed plants, and for the killing of sprouting stumps. The dinitro selective sprays are recommended for the control of annual weeds in flax, peas, cereals and other crops.

Tentative recommendations as to 2, 4-D concentrations were made. "The 0.1% solution . . . may be considered the standard concentration. Spray of this concentration, applied in amounts sufficient to wet all leaves on low-growing or turf areas, will require about 1 gallon per square rod, or 1.3 pounds of 2, 4-D acid or equivalent per acre. Heavier growths may require up to 2 gallons of spray per square rod, or about 2½ pounds of 2, 4-D acid per acre," the report said. Resistant plants may require up to double the standard amount, or 2½ to 5 pounds of 2, 4-D acid per acre. Application may be made by dusts or concentrated sprays, giving adequate and uniform coverage. The Committee adds that "these suggestions are not intended to supplant local directions, or the directions of manufacturers."

2, 4-D should be applied to plants in active growth, or to seedlings for best results. Such organisms are much more susceptible than the same plant in dormant or mature stages. By the same token, soil conditions which promote active growth make weeds more susceptible to the material. Matter of temperature also enters into the picture. Cool weather, from 40° to 60° F, slows up the speed of action more than it reduces the final effect. On the other hand, extremely high temperatures may contribute to poor kills.

Leaching and decomposition remove 2, 4-D from soil in a comparatively short time after the material is applied in humid areas. Under dry soil conditions, the toxicity may remain much longer, "perhaps a year or more", the report says. A search for suitable equipment and methods of application is needed, since such are limiting factors in many uses.

The danger of livestock being injured from feeding on treated pastures is not a serious factor. "Tests have demonstrated that no injury to livestock in treated pastures is to be anticipated from standard treatments with present formulations of 2, 4-D", the committee reports.

Labeling of 2, 4-D products should include: 1. The net weight in the package. 2. The chemical compound or compounds, of 2, 4-D which constitute(s) the active ingredient. 3. The equivalent percentage of 2, 4-D acid in the formulation as sold.

All the foregoing tentative conclusions are gained on the basis of two years of extensive experimentation in the midwestern states represented in the group. These states include Kansas, Nebraska, Minnesota, Illinois, Indiana, Iowa, Michigan, Missouri, N. Dakota, S. Dakota, Ohio, Oklahoma, and Wisconsin.

The following table of 2, 4-D equivalents is presented by the Conference:

2, 4-D Equivalents

Substance	*Molecular weights*	*% 2,4-D acid*	*Grams required to contain 100 grams of 2,4-D acid*
2,4-D acid	220	100	100
2,4-D ammonium salt	237	93	108
2,4-D sodium salt (anhydrous)	242	91	110
2,4-D sodium salt monohydrate	260	85	119
2,4-D diethanolamine salt	305	72	139
2,4-D triethanolamine salt	339	65	154
2,4-D methyl ester	234	94	106
2,4-D ethyl ester	248	89	112
2,4-D propyl esters (two with same weight)	262	84	119
2,4-D butyl esters (four with same weight)	276	80	125
2,4-D amyl esters (about 15 all with same weight)	290	76	132

AAEE MEETING

(*Continued from Page 29*)

"333" were discussed by Dr. H. A. Jones of Dodge and Olcott, Inc., New York.

A representative of Monsanto Chemical Co., St. Louis, spoke on hexaethyltetraphosphate, describing its abilities to control red spider and aphids as well as other insect pests.

The insecticide "Prryania" was discussed by Dr. R. E. Heal of Merck & Company, Rahway, N. J. Basis for this material comes from the root and stem of a South American tree, "Ryania Speciosa", he indicated. Experiments thus far indicate good control against the European corn borer, the elm leaf beetle, codling moth, and the cinch bug.

An insecticide similar in action to DDT was described. It is bismethoxytrichloroethane, reportedly found to be effective in tests on Mexican bean beetle and other sucking insects. This product is made by E. I. duPont de Nemours & Co.

A joint session attracted the attention of members of both societies on Tuesday morning. The discussion arranged by Dr. J. E. Yeager, was titled, "Insect physiological research in relation to DDT and other new insecticides." Dr. Kenneth D. Roeder of Tufts college described the action of DDT on insects as causing "violent spasms" in the muscles of the tested insect, and stated that twitching was noted even in amputated legs of cockroaches when the insecticide came in contact with the disconnected member. He presented charts showing how through the recording of electrical charges on instruments, it was possible to determine the tremors of nerves and to record their reverberations at the rate of 400 to 500 per second. Further charts indicated that with weaker concentrations of DDT, a time lag was noted, but that the final results were the same. Dr. Roeder explained that the effect of DDT on the sensory nerves is principally responsible for a "barrage of nervous discharges" which completely disrupt the insect's nervous system.

Dr. Julian M. Tobias of the University of Chicago described experiments on cockroaches with DDT from a "surgical" point of view. He stated that in his opinion, DDT is as toxic for mammals as for insects, but that the rate of absorption through the outer surface of an insect is "tremendously greater" than that of any mammal. Tests have revealed the same amount of poison entering an insect through its surface, as is found in other animals after injection, a most unusual result.

Answering a question as to exactly how DDT kills insects, Dr. Tobias said that it is believed that the insect exhausts its nervous energy through violent convulsions, uses up its store of carbohydrates, and dies of starvation. Through anesthesia, the supply of carbohydrates in poisoned roaches has been preserved, but this failed to prevent death. He concluded that destruction of carbohydrates is a function of DDT, but does not constitute actual cause of death.

Of somewhat similar nature was the report by Dr. Lee E. Chadwick of the Edgewood Arsenal, whose experiments were with flies. DDT acts on the peripheral motor nerves of the fly, he said, causing violent twitching as in the case of roaches. He told of transplanting organs from DDT-poisoned flies to the bodies of healthy flies in order to determine the course of the poison. Such transplanted organs were unable to develop normally after exposure to the insecticide, he said. He stated further that pyrethrins also caused convulsions in flies.

There are various sites of action of DDT in flies. Progressive paralysis sets in immediately upon contact of the poison, or, in the case of a weak solution, the time may be delayed somewhat. The fly eventually dies of exhaustion, starvation, and from lack of water.

Tests with hexaethyltetraphosphate indicate an action similar to that of DDT, on flies, it was said, but this insecticide is apparently incapable of affecting the central nervous system of a roach. Dr. Chadwick recommended to all entomologists that they study meticulously the physiology of insects, better to understand how the various drugs affect the metabolism of various pests.

Dr. Daniel Ludwig of New York University told of experiments on Japanese beetle larvae with DDT. He stated that tremendous weight losses are noted in the poisoned larvae, sometimes as much as 35% in four days. Early observations caused the experimenters to attribute this to loss of water, but the belief now is that greatly increased muscular activity completely depletes the insect's reserves, probably causing it to starve.

Further discussions on the subject were presented by Dr. A. Glenn Richards of the University of Minnesota, and by Dr. J. Franklin Yeager of the U.S.D.A..

Among the scores of papers presented, many were of direct interest to the agricultural chemical field. These included a paper on "DDT residues on pea vines and the hazard of feeding DDT-treated pea vines to livestock." read by Prof. H. F. Wilson of Wisconsin U. Dr. Wilson said that in tests, dairy cows and sheep showed no ill effects from eating pea vines which had received amounts of DDT probably greater than would ordinarily be found from normal application. He showed charts indicating the concentration of applications by ground duster and by airplane.

Dr. Lester W. Hanna, Hillsboro, Oregon, told of tests comparing nicotine and hexaethyl tetraphosphate on the cabbage aphid and the black bean aphid. He indicated that the latter is the better aphicide, although there is need for eliminating certain objectionable properties of the material.

In a symposium on fruit insects, papers were presented covering data on control of pear psylla, sucking bugs on peaches, grape leaf-hoppers' Japanese beetles, long-tailed mealy bug, Mexican fruitfly, codling moth, European red mite, and red spider mite. In addition, Dr. A. M. Boyce of the University of California presented a report of studies with

DDT and other new materials on citrus plants, and Dr. W. J. O'Neill of Wenatchee, Washington, told about use of DDT in orchards of his state.

In the paper reading session on Cereal and Forage insects there were some papers reporting the results of the season's work on insecticides to control the European corn borer. These papers compared the effectiveness of DDT insecticides, those composed of "Ryania," and those containing rotenone. These tests indicated that DDT insecticides are somewhat more effective than the other materials.

The section on Agriculture attracted the attention of a considerable number of entomologists. The use of sulfathiazole for the control of American Foulbrood of bees was discussed in a few papers, and discussion followed by those present. The general concensus was that more work needs to be done on this phase of the work before the use of this material can be recommended generally.

The Convention passed a number of resolutions, among which were: one dealing with surveys, endorsing the idea of cooperative surveys and urging the establishment of a program to secure information on new infestations that may be developing, and securing information on the status of important insect pests, the latter aiding in advising farmers on control and in the distribution of needed equipment and supplies.

Another resolution was passed endorsing the model state insecticide bill and another one endorsing the idea of revising promptly the Insecticide Act of 1910.

Other resolutions recommended the establishment of a broad program for the control of forest insect pests and plant diseases, providing for a cooperative effort between states and the Federal Government for surveys and control programs when these are needed.

A discussion on insecticides featured the paper reading session on the final afternoon of the convention. Benzene hexachloride was the subject of a number of papers, including one by Dr. W. C. O'Kane of Durham, N. C. He told not only of the experimental work on insects, but also presented data regarding the effect of the material on plants, including reference to the absorption by certain plants of odor from the chemical.

A session on pest control equipment was also included in the final afternoon's program. Drs. A. M. Boyce of the University of California and Charles E. Palm of Cornell University showed still and moving pictures of late machinery used for application of insecticides, weed killers, and plant disease control chemicals.

The program committee composed of Dr. A. M. Boyce, chairman, Dr. Charles E. Palm, and G. J. Haeussler of the Bureau of Entomology and Plant Quarantine, U.S.D.A. was accorded a vote of appreciation for its work which was complicated by a change in plans which brought the meeting to Richmond rather than to Pittsburgh, Pa., as was originally planned.★★

PHYTOPATHOLOGISTS

(Continued from Page 47)

2 lbs. per 100 gallons; and with the fixed coppers 4 lbs. of 50 per cent metallic per 100 gallons are suggested.

Dusts in general are not as effective as sprays but where dusting is employed a 7 per cent copper dust and/or a 10 per cent "Zerlate" dust, applied at the rate of 40-50 lbs. per acre at 7-day intervals is suggested.

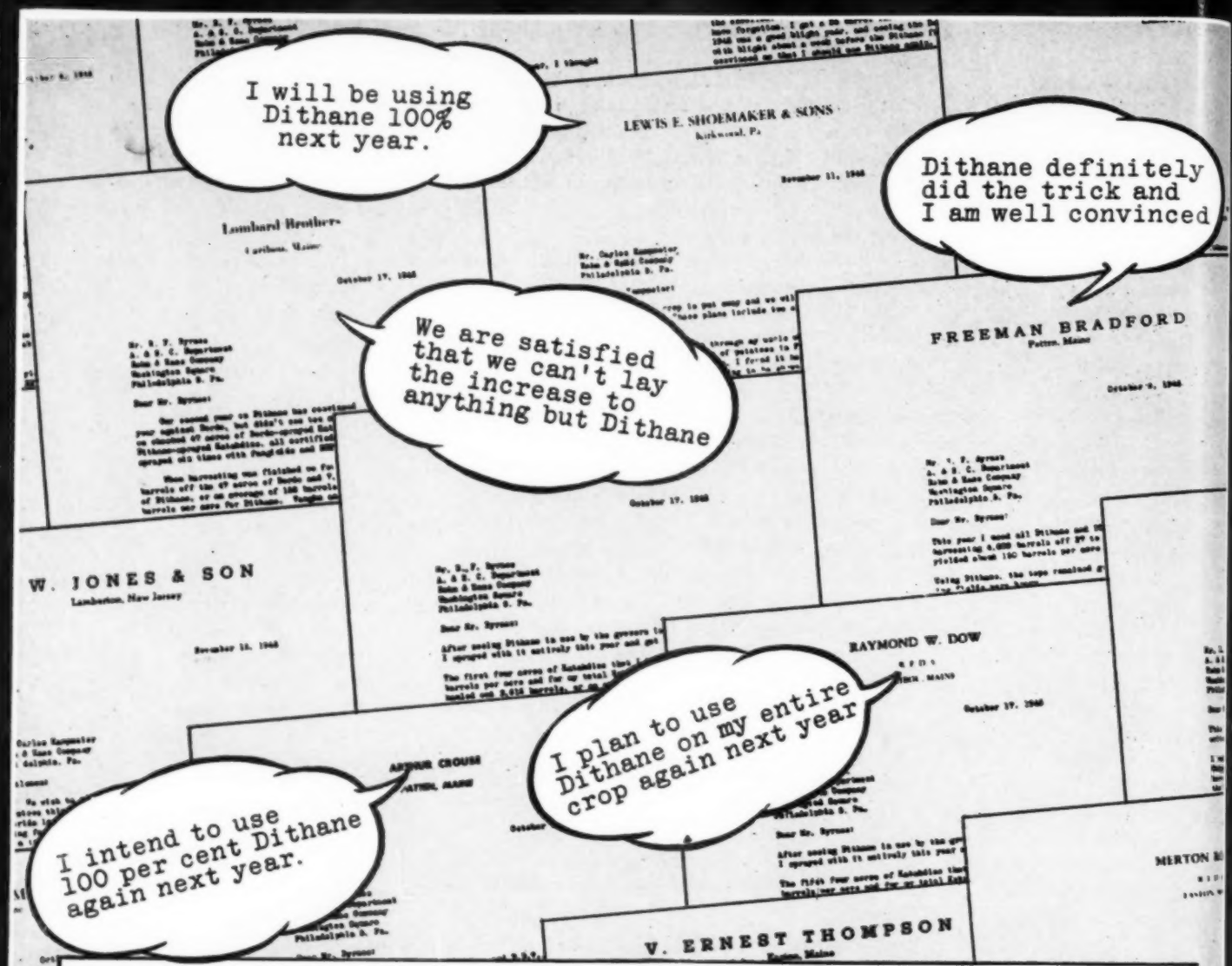
A paper presented by Curt Leben of Wisconsin University, prepared in collaboration with Dr. G. W. Keitt, also of Wisconsin, discussed the effect of an antibiotic substance extracted from *Streptomyces* sp., on apple leaf infection by *Venturia inaequalis*. He indicated that in experiments the substance was shown to be capable of completely inhibiting growth of *Venturia inaequalis* at 1 part to 8 million parts water, and inhibiting *Sclerotinia fructicola* at the rate of 1 part to 11 million parts of water. The paper stated further that there was no apparent loss in activity of ethanol solutions stored 11 months at 8° C. "The active material is precipitated from ethanol solutions on the addition of water," the summary stated. "In three greenhouse tests, infection was prevented or greatly reduced on susceptible apple leaves by a single spray application of an ethanol solution of the active material four hours or four days prior to inoculation with *Venturia inaequalis*."

In a section on fungicides under the chairmanship of Dr. J. W. Heuberger of Delaware, some ten papers were presented. Newer fungicides were discussed, including disodium ethylene bisdithiocarbamate and heptadecylglyoxalidine. The effect of dust composition on the adherence of copper dust, and other factors were also considered, including methods for correcting soil variation in field tests, and the pea seed treatment method of evaluating fungicides in the greenhouse. Other fungicide sections discussed other new fungicidal materials, including zinc ethylene bisdithiocarbamate as a fungicide on vegetables. A paper on the lack of correlation between yield and disease control with fungicides was also given at this session.

The annual banquet was held Sunday evening, with Dr. E. L. Waldee of the Utah Experiment Station relating his experiences as a plant pathologist studying the problems of agriculture in Japan. He was a special staff member under General MacArthur, with headquarters in Tokyo. Dr. Waldee showed numerous photographic slides of methods and equipment used by the Japanese farmer.

The nearly 300 persons registered at the meeting, included at least three women. These lady phytopathologists were Miss Emily Owen of American Aniline and Film Co., Easton, Pa.; Senorita Maria de los Angeles Melindez of Mexico City; and Dr. Helen Hart, editor of *Phytopathology*, the Society's official organ.

The thirty-ninth annual meeting of the Society is scheduled to be held late in 1947 in Chicago, it was announced. Committee in charge of of the 1946 convention included: Dr. E. M. Johnson, Dr. W. B. Dalleau, and Dr. Steven Diachun.★★



With Northern Growers, it's **DITHANE plus DDT** *for LargerPotato Crops*

LOCATION	VARIETY	BUSHELS PER ACRE		BUSHELS GAIN with DITHANE
		With DITHANE	With other fungicides	
Caribou	Katahdins, Chippewas	600	525	75
Fort Kent	Katahdins, Chippewas	555	480	75
Caribou	Katahdins	573	480	93
Easton	Green Mts.	541	486	55
Caribou	Katahdins	585	474	111
Easton	Katahdins	540	444	96
Limestone	Green Mts.	645	471	174

ACTUAL YIELD FIGURES PROVE THEY'RE RIGHT

On farm after farm in the North . . . in fact, the country over . . . potato growers report that regular spraying with DITHANE resulted in substantial increases in yields.

Table at left shows a few representative instances of actual gains resulting from the use of DITHANE in the Maine area.

DITHANE controls both early and late blight—is not injurious to potato plants even when applied during hot, dry weather . . . is easy to handle, does not clog spray nozzles.

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INDUSTRY NEWS

DDT Prices Lowered

Effective January 1st, the price on DDT, technical grade, in carload lots, dropped to 42½ cents per pound from the previous figure of 45 cents, it has been announced by E. I. duPont de Nemours & Co., Inc., Wilmington. The company also announced a reduction in the price of less-than-carload lots from 48 to 45 cents per pound. Prices on less-than-ton lots were cut from 50 cents to 48 cents per pound.

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"Toxaphene" Announced

Hercules Powder Company, Wilmington, announces a new insecticide toxicant, "Toxaphene," which in preliminary tests has shown itself to be equal in effectiveness to DDT against certain insects, and more toxic than DDT to others. The new product is a chlorinated camphene which for the past 18 months has been undergoing tests in many parts of the United States. It is said to be effective against cotton insects, tobacco horn worm, Mexican bean beetle, and flies. The product is presently available only to qualified testing agencies for experimental use. It comes in eight forms: technical grade, 25 per cent wettable powder, 25 per cent oil soluble concentrate, 50 per cent water miscible concentrate, 10, 20, and 50 per cent dust concentrates, and combined with "Thanite," another Hercules insecticide.

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Cal. Changes DDT Labeling

The State of California Bureau of Chemistry announces that the State Board of Chemistry has ruled that the poison label need no longer appear on packages of *powdered* materials containing DDT in a quantity not over 60%, where DDT is the only poisonous component. The change affects only powdered materials, and all other requirements remain as given in previous announcements by the Bureau of Chemistry. Labeling of economic poisons sold in California must conform not only to the economic poisons article of the agricultural code, but also to certain provisions of the poison law administered by the California State Board of Pharmacy, it is pointed out.

The Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture was recently presented the above statue as a Lasker Group Award, "in recognition of distinguished service in the solution of problems involving the health and comfort of the armed forces, with particular reference to insect-borne diseases."

Dr. F. C. Bishop, assistant bureau chief, in charge of research, accepted the award for the bureau. The citation reads in part, ". . . Not the least of the achievements of the Bureau has been . . . its research and control operations against insects of agricultural importance . . . helping to assure an adequate food supply for the armed forces and those behind the lines. The American Public Health Association cites these achievements of the Bureau . . . as a notable contribution to the public health."

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Co-op to Build

Consumers Cooperative Association, Kansas City, Mo., has announced plans for construction of a plant for manufacture of fertilizers at Eagle Grove, Ia. Estimated cost will be $150,000, with equipment to total $50,000 additional. Production capacity will be 20 tons per hour, it was stated. Operations will be in charge of R. R. Zerbuchen, director of CCA's manufacturing division.

ANTU Production Up

John Powell & Co., New York, announces a fifty per cent increase in the production of alpha napthyl thiourea (ANTU) rodenticide to meet the heavy demand for the product. The company reports that within the space of a few months, rodenticide supplies expected to meet the requirements of a year were sold out.

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Livestock Assn. Meets

The 50th golden jubilee anniversary of the United States Livestock Sanitary Association was observed at the organization's annual meeting in Chicago, Dec. 4 to 6. Devoted to the advancement of the nation's livestock industry, this scientific society centered its program discussions on new developments in control of diseases of cattle, hogs, sheep and poultry, including treatments with the new synthetic drug preparations.

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New Insecticide Film

Rohm & Haas Company, Philadelphia, has produced a motion picture featuring the development, testing, and actual use of insecticides in home, agricultural, and industrial applications. The pictorial work includes methods of testing sprays, laboratory and Government experiment station information, spraying of livestock, and numerous insect shots. It is recorded on 16 mm. sound film, and is available for showing.

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Geigy Unit Opens

A new laboratory has been opened on Bayonne, N. J., by the Geigy Company, of New York. The new facilities are located on a site adjoining that of its Bayonne plant. Addition of the laboratory offers opportunity for close collaboration between the technical staff of the American division and the parent firm, J. R. Geigy, S. A., Basle, Switzerland. In charge of the new laboratory is Dr. George R. Ferguson, chief entomologist.

Pyrethrum Test Controversy

AMERICAN importers of pyrethrum have been negotiating with the Kenya Farmers Association for the past several months in an attempt to straighten out a complicated testing and pricing controversy covering some of the 1946 shipments of Kenya pyrethrum to the United States. Involved is a sum estimated at something in the neighborhood of several hundred thousands of dollars, which American importers feel is due them because of failure of a substantial percentage of 1946 arrivals of pyrethum flowers to test up to the standard of 1.3 per cent pyrethrin content. A mission sent to the U. S. by the Kenya Farmers Association last September was understood to have proposed a compromise settlement, which was rejected by the importers. More recently other agencies involved have reopened the subject in an attempt to reach a satisfactory settlement. It is reported now that some adjustments have already been made and others will be settled very shortly.

The following background on the controversy was obtained from pyrethrum importers, as well as from the American representatives of the Kenya Farmers Association. During the war KFA sold its pyrethrum crop to the British Ministry of Supply which in turn sold this flower to the U. S. Commercial Co. Sales by the KFA to the British Ministry of Supply were on the basis of visual grading which does not involve chemical analysis of the flowers. Under this set-up Kenya growers received a guaranteed price, regardless of how the flowers tested as to pyrethrin content. On sales by the U. S. Commercial Co. to American importers, however, flowers were guaranteed to test 1.3 per cent, with allowances provided for shipments testing either above or below this figure.

When the war ended and the KFA, in October, 1945, resumed direct sales to American importers as agents for the British Board of Trade, the contracts with American buyers specified a 1.3 per cent pyrethrin content. The Kenya farmers, incidentally, have established their reputation as pyrethrum growers, ever since the crop was introduced there approximately ten years ago, by supplying high test flowers, and have always made quite a point of the fact that Kenya flowers test high in pyrethrins, and uniformly high, contrasted with flowers from Japan, which when this country supplied the American market were notoriously non-uniform and low in quality.

When Kenya arrivals began to come into the U. S. early in 1946, however, and tests were made by the two laboratories, one representing the KFA and the other representing the importers, it was reported that some of the shipments were rather badly deficient in pyrethrin content. American importers had already paid for their flowers in advance on the basis of 1.3 per cent pyrethrins. According to their understanding of the contract, it was an obligation of the American agents of the Kenya Farmers to render final invoicing based on the assays made in the United States and to make refunds for the deficiencies. It is these refunds that have been in dispute.

When the Kenya mission came to the United States last September, they advised the American importers that they must look to the British Ministry of Supply for their refunds. This came as quite a shock to the importers, as they were not aware that the BMS figured in any way in the contract, which they thought of as a specific purchase and sale agreement between the KFA and the various American importers. Apparently now, however, direct negotiations have been resumed and the prospect of early agreement is said to be bright.

The KFA charges that one reason for the possible disagreement between spot tests made in Kenya before the flowers were shipped, and the results of the testing laboratories in New York, might have been the fact the samples often were not taken, nor tests made, within the fourteen day period after landing specified in contracts. Loose samples, when held for an excessive period, do lose a certain percentage of pyrethrins. It is pointed out by the importers, however, that delays which occurred were simply due to an excessive volume of work being done by the two laboratories, and also that both the KFA laboratory, and the one testing for the importers, were responsible for such unavoidable delay.

Also under discussion is the possibility that the two laboratories may not have used exactly the same technique, due to changes in published procedures often adopted by individual laboratories. The Seil method, incidentally, has been revised in numerous details since originally published. The revised version, it is hoped, may be readied for publication some time this year, which would eliminate at least this one possible cause of confusion in reconciling divergent results of different laboratories.

Recent arrivals of pyrethrum flowers from Kenya are reported to be testing considerably higher than the disputed shipments of early 1946. It is, of course, usual for flowers originating from a fall crop to be of higher test, and flowers now coming in were harvested in Kenya in the fall months of 1946. The price to the importer for pyrethrum of fair average quality is currently 32½c per lb. This compares with a pre-war figure of approximately 18½c plus war risk and other landing charges. Importers are naturally reluctant to see anything that further increases cost of pyrethrum to the insecticide manufacturer, as they quite understandably do not want high cost of the product to act as a handicap to expanding use.

Pyrethrum is already priced well above its pre-war level, they point out. If the refunds are not made, this will have the effect of boosting the price approximately four cents per pound more, for, of course, a larger quantity of low test flowers are naturally required in making extracts of standard strengths. Whether or not pyrethrum can stand such an additional burden in its increasingly severe competitive battle with the new synthetic toxicants, is the essential question.★★

State Horticultural Societies Meet for Fall and Winter Conventions

HORTICULTURAL Societies and Fruit Growers' Associations of many states are active in various parts of the nation during the fall and winter months. During November, meetings were held by the Iowa State Horticultural Society and the Iowa Fruit Growers' Association at Des Moines, and December saw a host of gatherings of similar societies in widely scattered localities.

Included among the organizations meeting in December, were the following: Connecticut Pomological Society, in Hartford; Oregon State Horticultural Society in Eugene; Arkansas State Horticultural Society at Springdale; Washington State Horticultural Association, Yakima; Montana Horticultural Society at Polson. Michigan State Horticultural Society at Grand Rapids; Oklahoma Pecan Growers Association at Muskogee; and the Kansas State Horticultural Society at Wichita.

The Illinois State Horticultural Society held its meeting at the Abraham Lincoln Hotel, Springfield; Tennessee State Horticultural Society at Nashville; Indiana Horticultural Society at Indianapolis; New Jersey State Horticultural Society at Atlantic City; Virginia State Society at Richmond; and the Peninsula Horticultural Society of Delaware, at Dover.

Meetings scheduled for the month of January included the Massachusetts Fruit Growers' Association, January 7, 8 and 9 at Amherst; The Utah State Horticultural Society, January 10 and 11 at Hotel Utah, Salt Lake; The Maryland State Horticultural Society, January 2 and 3, at Hagerstown, Md.; Pensylvania State Horticultural Association, January 13, 14, 15 at Harrisburg; and New York State Horticultural Society, January 15, 16, 17, at Rochester.

Future meetings of similar groups are scheduled also. The Idaho State Horticultural Association plans to meet February 6 and 7 at Hotel Boise, Ida. Secretary of the association is A. Harold Davidson, Nampa, Idaho. Vermont State Horticultural Society has announced plans to meet February 11, at the Municipal Auditorium, Barre, Vt. Secretary of the group is C. H. Blasberg, Burlington, Vt. Ohio State Horticultural Society is scheduled to meet at the Deshler-Wallick Hotel, Columbus, on February 26, 27, and 28. F. H. Beach of Ohio State University, Columbus, is secretary.

Among meetings to be held later in the year are those planned by the South Dakota State Horticultural Society, and the Minnesota Fruit Growers' Association. The former plans to meet August 12, 13, 14 at Rapid City, S. D., and the latter in September at a place not yet announced.

Canners Association Recommends Procedure for Control of Late Blight

THE National Canners Association in cooperation with the Indiana Canners Association, held a special joint conference at Indianapolis November 20 and 21. The meeting was called to discuss the serious outbreaks of late tomato blight which caused heavy losses in the 1946 crops, and to formulate plans for 1947 to prevent a recurrence of blight losses. Plant disease and tomato specialists from 12 states were present at the conference.

Many factors are thought to have entered into the spread of the late blight fungus, the spores of which can be carried by wind. The blight was thought to be present in Florida in 1945 at which time it affected potatoes. It then became established on the tomato crop, moving up the eastern seaboard into New York state and Pennsylvania, shifting back into Maryland and was later found in the Midwest. The disease spreads under a combination of below-normal temperatures and above-normal moisture conditions.

The Indianapolis meeting devoted a considerable amount of time to the presentation of actual control data by the research men of the various tomato growing states. Two committees were chosen by the group to study the situation and to make recommendations for 1947. The first committee on disease control, was headed by Dr. R. J. Haskell of the U.S.D.A.; the other committee on plant growing was headed by F. C. Stokes, of New Jersey.

In making its report, the disease control committee stated that although late blight was the dominant disease this year, it may not always be so in years to come. The committee's considerations therefore embraced a long-time program of control of tomato foliage diseases in general. As to control programs, four major points of procedure were recommended as follows: Fall plowing, rotation (avoiding tomatoes after tomatoes, potatoes or other solanaceous crops), wider spacing between plants, and application of fungicides.

A number of recommendations were made in regard to fungicides. "Zerlate" was termed the "most effective" for use against anthracnose and leaf mold, as well as early blight. However, against late blight, fixed coppers, Bordeaux, or "Dithanes" seem to be superior. Dusts were described as "in general not as effective" as sprays.

The plant growing committee asked tomato growers to take extraordinary precautions in 1947, and that they "also re-examine every factor in the production program, and wherever possible, improve all present practices." Frequent and adequate spraying and dusting were requested as a safety measure.

Technical Briefs

Grape Diseases Controlled

Spraying of grapes for control of black rot and downy mildew diseases is given credit for much larger yields in New York state during the 1946 season as compared to that of the previous year. In one vineyard where the 1945 crop was completely destroyed by black rot, a yield of over 4 tons of grapes per acre was gathered. The vines had been sprayed three times with "Fermate" in 1946.

In another vineyard where there was a black rot infection of 17.7 per cent and 5.5 per cent of downy mildew, three applications of a Bordeaux spray, 4-4-100, reduced black rot to .3 per cent, and completely eliminated downy mildew. In this same vineyard, control of diseases with dusts was about 50 per cent effective.

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ANTU Toxicity Tested

A paper on the toxicity of ANTU, rodenticide, has been prepared by Wayne A. Anderson of the Bureau of Animal Industry, U.S.D.A., and Curt P. Richter of Johns Hopkins Hospital, Baltimore. Tests were made on chickens and pigs, results of which indicate that alpha naphthyl thiourea can poison pigs and young chicks, but appears to be less toxic for older birds. The experiments were made on chicks from three to five weeks of age. Half of the chicks were dead 18 hours after eating a 2 per cent or 3 per cent mixture of ANTU in mash. Of the survivors, most of those supplied with plain mash survived, but those given more poisoned mash died within four days even though they had eaten but little additional food. All but one of a group of pullets weighing on an average of 1½ lbs. survived a dose of 2 per cent poisoned mash, but the survivors lost considerable weight and were regarded commercially as unprofitable birds.

Tests with pigs indicated that about 105 g. of 2 per cent mixture of ANTU with mash might suffice to kill a 125-lb. pig, whereas mash containing 2 per cent ANTU, fed at the rate of 25 mg. per kilogram of body weight to a 136-lb. pig was not fatal and failed to produce symptoms of serious distress. Tests by feeding ANTU-poisoned rats to pigs brought the conclusion that it is probable that pigs will not eat enough rats to be poisoned. Since such small dosages are necessary to kill the Norway rat, the amount thus ingested by the hog is less than lethal.

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"Dithane" for Cucurbits

Use of a disodium ethylene bisdithiocarbamate fungicide, "Dithane," is credited with giving cucumber growers on eastern Long Island a larger yield despite the severity of cucurbit disease in 1946. The synthetic fungicide is said to have helped in producing better yields than had been obtained with other spray materials previously used for disease control.

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Fog Controls Aphid

Fogging operations for control of aphid was carried out successfully on eighty acres of melons near Dos Palos, California, late in 1946. The material used was "Vapatone," manufactured by California Spray Chemical Co., and the fog machine was a Todd Insecticidal Fox Applicator, mounted on a tractor-drawn trailer. Reports indicate that the operations successfully repelled the pest which had withstood a number of previous control attempts, and the valuable crop was saved.

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2,4-D vs. Tropical Weeds

How 2,4-D is aiding in the control of Nutgrass, Dayflower, water hyacinth, Royal Waterlily and Lotus Lily is described in *Agriculture in the Americas*, August, 1946. Nutgrass, a widespread pest which by other methods was extremely difficult to control, was killed in one month after an application of 1 part commercial 2,4-D to 1,000 parts of water which had been sprayed. (In heavy stands where the soil has been cultivated, more applications appeared to be necessary.)

Dayflower is of ubiquitous nature in the tropics, interfering with sugarcane crops. Spraying with ½ of 1 part 2,4-D to 1,000 parts water controlled the pest. To eradicate Caladium, which occupies some of the richest, usually moist, lowland soils in that hemisphere of the world, usually requires more than one application of 2,4-D. The foliage is very susceptible to the poison, however.

Compared to the barge-like machines ordinarily used to clear tropical irrigation ditches of water hyacinth plants which block such waterways, 2,4-D is much less expensive and more effective. Single applications of 2 parts 2,4-D to 1,000 parts of water appear to result in a satisfactory kill. Somewhat the same report is made for Royal waterlily which has leaves 6 feet or more in diameter, and roots which are usually embedded in mud 5 or more feet below water, presenting a serious problem of control. However, single applications of 2,4-D (2 parts to 1,000) killed all plants in a pond on the station grounds. Lotus lilies, like the Royal species, appeared also to be susceptible to 2,4-D poison.

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Nut Tree Pest Control

Observing that the problem of insect control in nut culture has received far less attention in America than most other crops, J. S. Houser of the Ohio Experiment Station, Wooster, discusses the subject in the December, 1946 issue of *American Fruit Grower*. He describes the insects which attack nut trees, explaining how such infestations affect the crop, retarding growth and resulting in small kernels. The author concludes that although the present status of the nut industry does not seem to warrant the intensive activity in insect control that is practical in

some other lines of horticulture, he expresses belief that light crops, crop failures, and impaired quality are all associated with the devitalizing influence of insect attack.

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Rhode Island Report

The new disease of grasses, called "copper spot," can be controlled by several new organic chemicals, according to reports of investigations at the Rhode Island Agricultural Experiment Station, Kingston, R. I.

This new disease has only recently been described, but is apparently spreading rapidly and is being reported from more and more states every year. "Standard" fungicides do not give sufficient control of the disease, in the opinion of the Rhode Island researchers. During July, 1945, the disease approached epidemic proportions on Piper velvet bent grass in Rhode Island. Excellent control however, was obtained by treating plots with "Puraturf," "Puratized No. 177," and "Zerlate," according to the progress report in the station's 58th annual review of its activities.

After 41 days, plots treated with the first two named compounds had less than 1 percent of disease in them, while the "Zerlate"-treated plot had slightly less than 3 percent. After 58 days the increase of disease incidence was still below 1 percent where "Puratized No. 177" was used, but had increased to 6 percent on the "Puratized" blocks and to 15 percent on the "Zerlate" plots. On untreated check plots the average percentage of disease increased from 10 to 24, between the two dates when readings were made.

Pre-storage treatment of apples with carbon dioxide to control scald, had "encouraging" results, the Rhode Island station reported. Not only was incidence less, but severity was also reduced by treatments. The most satisfactory concentrations and periods of exposure for all conditions, however, had not been worked out when the report was released. The tests also revealed that both rats and mice, which can cause considerable damage to fruits in cold storage, are killed in less than 5 hours by a concentration of 20 percent carbon dioxide, supplied as dry ice, at a rate of 25 to 30 lbs. per 1,000 cu. ft. of storage capacity. Vaporization of the carbon dioxide from the dry ice was hastened by use of an electric fan in tightly sealed storage rooms during the period of treatment. The carbon dioxide is safer than methyl bromide for killing the rodents in storage, the report asserts. It does not injure the fruit and may be used safely without gas masks being necessary for operators.

The report includes an account of the use of two new fungicides, "Puratized" agricultural spray and "Phygon," for eradicating apple scale. Both inhibit apple scab lesions, a characteristic making them superior to 12 other fungicides used in orchard trials with McIntosh apples, it was claimed. Previously liquid lime-sulfur had been relied on to "burn out" scab infection, when weather conditions prevented use of a protective fungicide, even though the lime-sulfur injured foliage.

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DDT Summarized

"Investigations with DDT and Other New Insecticides in 1945," a new progress report prepared under the direction of the division of Entomology and Parasitology, University of California, Berkeley, was recently released. The report, in booklet form under the designation of "Circular No. 365," contains over 100 pages of information about the experiments undertaken by the division. Dr. E. O. Essig of the division, stated that in most of these tests, DDT proved to be very effective.

Regardless of the promising results, however, the division is still reluctant to give DDT unqualified endorsement until certain doubtful points are further clarified; particularly in its use as an agricultural insecticide. Other promising insecticides, including sabadilla, D-D, DDD, and EBD, were also reviewed in the report. Dr. Essig stated that there is need of more extended research on residual effects of these new insecticides under wider climatic conditions, and on the prevention or removal of undesirable residues. There is also need, he commented, for analytical chemical research on absorption of DDT by plant and animal tissues.

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Georgia Analyzes Soils

Chemical analysis of about 5,000 soil samples was made for Georgia farmers during the past 12 months, it is reported by the Soils Laboratory of the Georgia Experiment Station, Experiment, Georgia. Recommendations for fertilizer and lime, based upon the results of the analysis and information supplied by the farmer, were sent out for each sample tested.

Dr. L. C. Olson, associate agronomist at the Station, in charge of the Soil Testing Laboratory, said that a cooperative agreement has been worked out between the Georgia Experiment Station and the University of Georgia College of Agriculture whereby farmers in the Athens area may send their soil samples to the College and those in the Griffin area may send their samples to the Station.

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BHC Booklet Available

John Powell & Co., New York, has issued a new technical bulletin on "Powco Brand BHC" (Benzene Hexachloride). The booklet describes the product, tracing its history from its discovery by Faraday in 1825, through its first use as an insecticide in France, to its wartime use in England in controlling the turnip flea beetle, and its record in the U. S. BHC is considered a possible valuable adjunct to DDT, both as a fumigant and a contact poison in addition to its function as a stomach poison. BHC has been found valuable in control of many aphids, grain insects, soil infecting insects, grasshoppers, cotton insects, cattle lice, and a number of truck crop insects. The Powell Company will market BHC as "BHC-50" and "BHC-50W," indicating both powder and wettable powder forms.

Raw Material Markets . .

LITTLE opportunity for optimism is seen in a view of the market situation as regards the insecticide supply for 1947. Raw material shortages. transportation difficulties. and labor-management disputes all contribute to the general unpromising picture. Two months after the demise of O.P.A. finds advanced prices on some raw materials. but production of finished products is being aided by the change. The industry is still urging consumers to place orders early so that manufacturers may estimate market demands with fair accuracy.

The fertilizer situation appeared to be brightening somewhat with an announcement by the Civilian Production Administration that 65 new mixing plants and 44 expansions were either constructed during the past year. or are now under way. Although this on the surface would indicate greater supplies of fertilizer for the American farmer. it must be remembered that these added facilities also mean a greater drain on the already limited supplies of raw materials.

Insecticides

Brightest spot in the insecticide picture is the pyrethrum situation. Pyrethrum is reported in "good supply". and is expected to offer no serious problem during 1947. Imports during the fall months were heavy. adding to an already outstanding import record made during previous months of 1946. The first nine months of the year saw 16.322.000 pounds of pryethrum imported into the American market.

Other insecticidal materials present a story not quite so happy: such as white arsenic. imports of which in September were 44 per cent below that of August. and low for any month since March: calcium arsenate which is being exported in fairly heavy amounts as compared to the 1947 supply which is dependent upon current output since there was no carry-over from last season. Lead arsenate faces a double jeopardy with severe shortages of its chief ingredients . . . lead and arsenic. Output in September was only 253.000 pounds against 1.630.000 pounds the previous month. and exports amounted to half the amount produced. (125.-000 lbs.) Principal destinations were Brazil and the Union of South Africa. Paris green. on the other hand. is expected to meet the 1947 demand.

Several factors enter in to the shortage of DDT. Although the output is not particularly in arrears. demand has caused all production to be contracted heavily into 1947. Whether the supply will meet the tremendous demand is not yet clear. but it is agreed that the margin will be small. regardless. A shortage of chlorine is the chief hindrance to full production of DDT at present. The price of DDT has just been dropped 2½c per pound by one of the leading producers.

A tight situation obtains on nicotine. and the outlook for 1947 is one of uncertainty. Although production is expected to equal that of 1946. the supply will fall short of domestic and export needs. the industry believes. Exports for the first 9 months of 1946 were smaller than those of the same period of 1945. The figures are. 122.000 pounds exported January-September. 1946; 343.000 pounds during that period of 1945.

In the fungicide field. copper sulfate is expected to be in a tight situation with an agricultural demand for 1947 exceeding previous estimates. and a steadily increasing industrial consumption. Prices have advanced about 1c a pound on the 99 per cent crystals.

Fertilizers

Reports from the National Fertilizer Association indicate that the tax tag sales of fertilizers in 16 states were exceeding by a sizeable margin sales made in corresponding months last year. In the first four months of the 1946-47 fertilizer year the ratio was 1.878.270 tons for that period against 1.355.137 tons for the previous year.

Producers' stocks of byproduct ammonium sulfate increased a slight bit during September despite the heavy demand. These stocks amounted to some 55 percent more than those on hand a year earlier. Synthetic ammonium sulfate production recovered from the preceding month's low in September. with 9.829 tons being turned out. This was nearly twice the amount of August's output. and was a 27 per cent increase over September of last year.

Because of a world shortage of nitrogenous fertilizers. the 1946-47 allocation program of the International Food Council calls for extensive shipments of Chilean nitrate. which may cause a decrease in tonnage destined for the U. S. In this case. supply will not meet the needs of U. S. agriculture. Although September's imports were low. subsequent months were expected to show a slight pickup. Output in Chile itself is up. but world-wide demand is greater than available materials. However. in the United States. all ammonia producers are concentrating on fertilizer materials. although it is expected that later there will be some conversion to industrial nitrogen and other chemicals.

Very small inventories of superphosphate in the U. S. indicate a tight market despite increased outputs of P_2O_5. Production of normal superphosphate in September amounted to 642.002 tons. a 9 percent increase over that same month of 1945. But because of unprecedented demand. total consumption was heavier and inventories were about 30 percent lower than those at the end of September last year. This is considered a small reserve in the face of the coming heavy seasonal demand.

In the phosphate rock outlook. one sees an unchanged situation: heavy demands from acidulators and from exporters readily consume all that is produced. New mining operations in Florida are looked to for some relief. Repair of war-

damaged phosphate rock installations in Nauru and Ocean Islands has made possible small shipments from there, of phosphate rock to Australia and New Zealand.

Potash, still under allocation by the Civilian Production Administration, is experiencing an increased tonnage for agriculture during period 8 (which continues to March 31, 1947). The C.P.A. has granted this increase for use of new and expanded fertilizer mixing plants, including some 65 new plants and 44 expansions. Allocation for period 8 is 679,338 tons as compared with 633,425 tons for period 6.

Rotenone supplies are still a question in the United States as they have been since the removal of price ceilings in November set the stage for speculative prices on root. The result has been a ceasing of exports by the Peruvian producers until the market becomes more settled. Industry spokesmen express belief that future events in the rotenone situation can take one of two courses. One possibility is that large-scale speculative of panic buying of root of rotenone products in the United States may produce a sort of black market situation. The alternative is that if speculative buyers find it impossible to unload their goods rapidly and at a wide profit margin, the market may before too long a time, find its own level and assume a more normal trend in line with the real supply and demand.

Although adequate supplies are said to be in the U.S., distribution of the material is not ideal, according to an equitable apportionment. Individual manufacturers therefore may find themselves short of rotenone, and there may be localized area shortages.

GUEST EDITORIAL

(*Continued from Page* 14)

ing communities.

At experiment stations and in industrial laboratories, chemical preparations for agricultural use are put through most rigorous tests under every condition likely to be encountered in the field. No final recommendations are made until all possibility of doubt is exhausted satisfactorily. Many splendid products are thus presented to agriculture with a great deal of research and experimentation behind them. Yet by this very fact, need is seen for the dissemination of more knowledge to those who make use of the materials.

It is encouraging in this respect, to note the upswing of enthusiasm toward meetings of men representing scientific thought and commercial interests. Attendance at recent gatherings of this type is very encouraging, as is the fact that widespread interest is being shown in meetings held from coast to coast.

The use of chemicals in agriculture is at the threshold of a new and complex era. New because of the tremendous influx of recently-evolved insecticides, fungicides, and weed killers, and complex for the same reason. A vastly stepped-up program of study is a "must" for everyone in the field.★★

LISTENING POST

(*Continued from Page 49*)

Valentine, and Tendergreen varieties of beans. The Southern States Cooperative obtained sufficient seed beans from Yuba County, California, to supply each cooperator for a limited garden test. A few demonstrations were on a scale large enough to be termed semi-commercial. As a rule, the seed was planted adjacent to beans from home-grown seed and/or from commercial sources. In a few demonstrations, plantings were isolated from other beans. Visits by the Extension Plant Pathologists and County Agents during the growing season gave a good cross-section.

In general, it might be stated that Western-grown seed produced larger yields and the plants were more free of disease than those from home-grown sources. However, the commercial seed, purchased from reliable seed dealers and which was probably Western-grown, produced about as well as the Western-grown seed used in this demonstration. In several cases where anthracnose and bacterial spot were observed in beans from Western-grown seed, the infection was found to have originated in the planting from home-grown seed nearby. When beans from Western-grown seed were isolated from other beans, they remained entirely free of anthracnose, but some mosaic was observed.★★

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Pa. Pest Group Meets

The first Pest Control Conference ever to be held at Pennsylvania State College is scheduled for February 3, 4 and 5. The program includes studies and identification of common and uncommon insect pests, a session on rodent control, and a demonstration of modern insecticides by members of the Pensylvania Agricultural Extension Service staff and research workers. Co-chairmen of the meeting are Dr. Edward H. Dusham, head of the department of zoology and entomology; and Dr. E. D. H. Frear, of the agricultural bio-chemistry staff, both of Pennsylvania State. The conference is restricted to operators residing in the state of Pennsylvania.

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Expands in Arkansas

Reasor-Hill Corp. of Little Rock, Ark., has leased from the War Assets Administration, 35,000 square feet of floor space at the former site of the Ark. Ordnance Plant in Jacksonville, to manufacture agricultural chemicals. Cotton dusting compounds, weed killers, and insecticides are to be produced and marketed by the company.

New Lofstrand Head

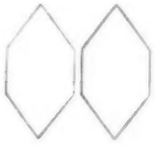
The Sprayer Division of Lofstrand Company, Silver Spring, Md., announces that H. S. Shinn now heads the division. The company manufactures sprayers widely used in pest control in dairies and other agricultural applications. Mr. Shinn was formerly with the research and development division of Lofstrand, in which position he developed a sprayer used by the U. S. armed forces in many parts of the world. He is an electrical engineer, holding two degrees from West Virginia Univ.

Industry Patents

The following patents have recently been issued by the U. S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U. S. Patent Office, Washington 25, D. C.

2,411,253. PEST CONTROL. Patent granted November 19, 1946, to Albert L. Flenner and Norman E. Searle, Wilmington, Del., assignors to E. I. duPont de Nemours & Co., Wilmington. A parasiticidal composition containing as an essential active ingredient the compound having the formula R—E—X—Y in which R is a thiazole attached at the 2-position, X is a methylene radical bearing at least one hydrogen and Y represents an aliphatic substituted or unsubstituted amino radical linked through amino nitrogen to X, and a carrier therefor.

2,411,530. PARASITICIDAL COMPOSITIONS. Patent issued November 26, 1946, to Robert H. Dreisbach and Fred W. Fletcher, Midland, Mich., assignors to the Dow Chemical Co., Midland. An insecticidal composition comprising as active ingredients (1) an alkylated naphthalene having the formula



wherein R is selected from the group consisting of ethyl and propyl radicals x is an integer from 1 to 5, inclusive, and the sum of the carbon atoms in the alkyl substituents is at least 3, and (2) a member of the class of plant toxicants consisting of pyrethrins and rotenone.

2,411,566. TOXIC COMPOSITION. Patent issued November 26, 1946, to Theodore W. Evans, Oakland, Calif., assignor to Shell Development Co., San Francisco. A process of eradicating nematodes from the soil and minimizing attack thereby on plants, comprising introducing below the soil surface in the vicinity of said nematodes an agent selected from the group consisting of 1,1-dihalopropene—2 and the 2-alkyl homologues thereof, wherein the alkyl substituent has one to three carbon atoms.

2,411,720. INSECT REPELLENT. Patent granted November 26, 1946, to Samuel I. Gertler, Washington, D. C., assignor to the U. S. of America, as represented by the Secretary of Agriculture. An insect repellent comprising about 60 parts of pyrethrum marc and about 2 parts of N,N-diethylpiperonylamide.

Trade Mark APPLICATIONS

4-X, in hollow letters, for weed control-namely, a concentrated chemical. Filed Mar. 26, 1946, by O. M. Scott & Sons Co., Marysville, O. Claims use since Mar. 11, 1946.

DEEDETH, in script letters for. Filed Mar. 28, 1946, by Distributors Incorporated, St. Paul, Minn. Claims use since Mar. 1, 1946.

NITROSE, in sans serif capital letters. For colic antidote for veterinary use. Filed Apr. 11, 1946, by Fort Dodge Laboratories, Inc., Ft. Dodge, Iowa. Claims use since October, 1937.

TARTAGEN, in sans serif capital letters. For drench for veterinary use. Filed Apr. 11, 1946, by Fort Dodge Laboratories, Inc., Ft. Dodge, Ia. Claims use since June, 1940.

RANCH WAY, in script letters appearing to be made of rope, for veternarian supplies, namely, pink eye powder, sulfa powder, calf tonic, cattle grub killer, lice oil spray, and ear tick killer. Filed Mar. 10, 1945, by John B. Stribling & Son, Ltd., doing business as Ranchway Remedies Co., Rotan, Texas. Claims use since June 1, 1944.

ALOYL, in hollow letters, hand-drawn at an angle. For animal fly spray. Filed Apr. 30, 1945, by Lyman B. Warren, Jr., doing business as the Aloyl Co., St. Paul, Minn. Claims use since Jan. 1, 1937.

B-Y-21, in arched capital letters, for ingredients or supplements of foods, containing riboflavin and other nutritive elements, for addition to the feed of poultry and livestock. Filed Aug. 17, 1945, by Commercial Solvents Corp., New York. Claims use since Apr. 2, 1945.

BLACK WIDOW WORM SMEAR, small capital leters in semi-circular arrangement, arching over drawing of black spider. For preparation for use in treatment of screw worms, wire cuts, pink eyes and cancer eyes in cattle, sheep, and horses. Filed Feb. 26, 1946 by Charles A. Wedgeworth, Pampa, Tex. Claims use since Feb. 15, 1946.

COPPER—8, In thin capital letters, for chemical products for use in combatting insects and fungi. Filed March 14, 1946, by Monsanto Chemical Co., St. Louis. Claims use since Feb. 11, 1946.

NUFF . . . In heavy capital letters, for insectifuge. Filed March 19, 1946, by Oscar Hayes, doing business as Atlas Laboratories, Akron, Ohio. Claims use since 1920.

OVAL-SHAPED DESIGN FOR PARASITICIDES — namely, insecticides and fungicides; spray adjuvants, herbicides and compounds which influence specific physiological processes in plants. Filed, Nov. 6, 1945, by California Spray-Chemical Corp., Richmond, Calif.

Trade Marks GRANTED

423,526. SPRAY DISCS AND SPRAY WHIRLS USED IN AGRICULTURE SPRAY EQUIPMENT. Roy E. Cooley, doing business as Cooley Spray Equipment Works, Somers, Conn. Filed October 30, 1945.

424,164. INSECTICIDES. Filed October 29, 1945, by Chandler R. Parsons, doing business as Parsons Chemical Works, Grand Ledge, Mich.

424,240. RODENTICIDE. Filed March 25, 1946, by Dr. Hess and Clark, Inc., Ashland, Ohio.

425,242. FERTILIZERS. Filed August 2, 1945, by Growers Service and Supply Co., Yakima, Washington.

425,279. EXFOLIATED VERMICILITE FOR SOIL CONDITIONING AND PLANT GERMINATION. Filed December 6, 1945, by Universal Zonolite Insulation Co., Chicago, Ill.

425,611. PARASITICIDES — namely, insecticides, fungicides, and germicides, spray adjuvants, herbicides and compounds which influence specific physiological processes in plants. Filed January 29, by California Spray Chemical Corp., Richmond, Calif.

425,651. CHEMICAL PRODUCTS FOR USE IN COMBATTING AGRICULTURAL FUNGI. Filed March 16, 1946, by Monsanto Chemical Co., St. Louis.

425,664. INSECTICIDES. Filed Mar. 28, 1946, by McLaughlin-Gormley-King Co., Minneapolis, Minn.

425,674. INSECTICIDES AND FUNGICIDES. Filed April 3, 1946, by Velsicol Corp., Chicago.

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Dr. McCallan Elected

Dr. S. E. A. McCallan of Boyce Thompson Institute, Yonkers, N. Y., was elected president of the newly-created North East Division of the American Phytopathological Society at the recent meeting in Amherst, Massachusetts. Other officers named included Dr. M. T. Hilborn, of the Maine Agricultural Experiment Station, vice-president; Dr. W. T. Schroeder of New York Agricultural Experiment Station, Secretary-treasurer, and Dr. T. Sproston, University of Vermont, councillor.

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Latin Ag. School Grows

A booklet describing the "Escuela Agricola Panamericana," a school founded in 1944 at Tegucigalpa, Honduras, by the United Fruit Company, of Boston, was recently published by the company. The book contains an account of the school which was established to bring technical agricultural training to young men of Latin America, giving them instruction in better methods of food production.

J. E. Carrigan Honored

Joseph E. Carrigan, dean of the University of Vermont's college of Agriculture, and director of the Vermont Agricultural Extension Service, has been chosen America's outstanding Extension worker for 1946. The award was made in Chicago, December 15, by Epsilon Sigma Phi, national fraternity of Extension workers, which each year selects one person from the thousands of extension personnel in the United States, Alaska, Hawaii and Puerto Rico.

Mr. Carrigan has for several years served with the Extension section of the Land Grand College Association, becoming chairman in 1941. In 1946 he was given the honorary degree of Doctor of Laws by the University of Maine, and at that time was cited as having "contributed notably to the advancement of agriculture throughout New England."

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Govt. Operation Decried

The National Grange, in its recent meeting in Portland, Oregon, went on record as opposing Government operation of fertilizer plants, in favor of private enterprise. The position of the Grange, as expressed in the resolution adopted, is that the Government should stay out of this field unless it is clearly demonstrated that such a plan of operation would be of advantage to the American farmer's welfare.

•

Latex Spray Announced

A new spray chemical, polyethylene polysulfide, synthetic rubberlike latex derived from petroleum and sulfur has been announced by Goodrich Chemical Company, Cleveland, Ohio. The material has been field tested for the past two years, and has proved satisfactory over a wide range of conditions, according to the manufacturers. As an adhesive for standard insecticides, the product is said to have shown great promise. It is compatible with fungicides such as Bordeaux, sulfur and lime sulfurs, and with many commonly-used insecticides.

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To Meet at U. of California

An education conference open to all pest control operators is scheduled to be held at the University of California, Berkeley, February 10, 11, 12, 1947. The gathering, sponsored by the California U. College of Agriculture, is in charge of Entomology and Parasitology.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of Agricultural Chemicals, 254 W. 31st St., New York 1. Closing date: 1st of month.

Manufacturers' Representatives Wanted to sell old established agricultural insecticide line to seed, hardware and drug jobbers. Territories now being organized for such representation to replace direct company selling. Please give complete pertinent information in first letter. Address Box 138, care of *Agricultural Chemicals.*

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Wanted: To represent manufacturer of bulk and packaged agricultural chemicals for sales to mixers and jobbers. Address Box 139, care of *Agricultural Chemicals.*

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Entomologist-Aerosol: Progressive chemical company, newly active in the manufacture and distribution of Aerosol Insecticides for industrial application wants competent Entomologist for Technical Service and for Contact work, at the Scientific level, with current development and research in the United States. Excellent oportunity for the right man. Salary open. Location, Virginia. Address Box 140, care of *Agricultural Chemicals.*

•

Entomologist - Chemist: Progressive chemical company newly active in the manufacture and distribution of Aerosol Insecticides for industrial application wants Entomologist-Chemist for laboratory supervisory control and research. Unusual opportunity for junior member of some group now working in this field to extend scope of activity and research. Salary open. Location, Virginia. Address Box 141, care of *Agricultural Chemicals.*

•

INSECTICIDE CONSULTANTS

Are you selling potato growers a spray or dust program that will benefit them and make you some money?

We are experienced in commercial potato spraying and dusting from Colorado to the Atlantic.

AMHERST CHEMICALS, INC.
Dean Asquith, President
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Insecticides — Formulation
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Eighteen Years consulting work. Thirty years technical agriculture.

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ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands; Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISOR ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 EMERSON STREET
PALO ALTO, CALIFORNIA

Research Handbook Out

A new handbook, "The Coordination of Motive, Men and Money in Industrial Research," has been published recently by the Standard Oil Company of California, San Francisco. Topics covered in the book include the origins of science, technical research and laboratories, industrial research motives, general organization and coordination; management guides for executives and key staff personnel, and the provision of funds and their control. Charts illustrate divisions of responsibility ,executive functions, relationships and limits of authority. The handbook is available to management, interested businesses, educators and to those interested in organization and research generally.

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TALE ENDS

ONE of the highlights of the recent entomological meeting at Richmond, Va., was the appearance on the program at the evening banquet, a colored male chorus of seven voices. The singers rendered a group of old negro spirituals in true southern style.

Featured speaker at the banquet was Dr. J. van der Vecht, entomologist of the Instituut voor Plantenziekten, Buitenzorg, Java, who related his experiences as a prisoner of the Japanese in the far east during three and a half years. The talk, though largely of grim nature, was not without its touch of humor. Dr. van der Vecht told of his efforts to organize a little entomological society within the prison, and to teach science to the boys even though no textbooks were available. "We just taught them from memory", he recalled, and stated further that this method worked quite well.

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Doug Malcolm of R. T. Vanderbilt Co., New York, was looking around the lobby of the John Marshall in search of Bill Feustel, also of Vanderbilt, who was unaccountably delayed. A telegram told the story. It read: "Baby daughter arrived safely Saturday (Dec. 7) Please convey news to my entomological friends."

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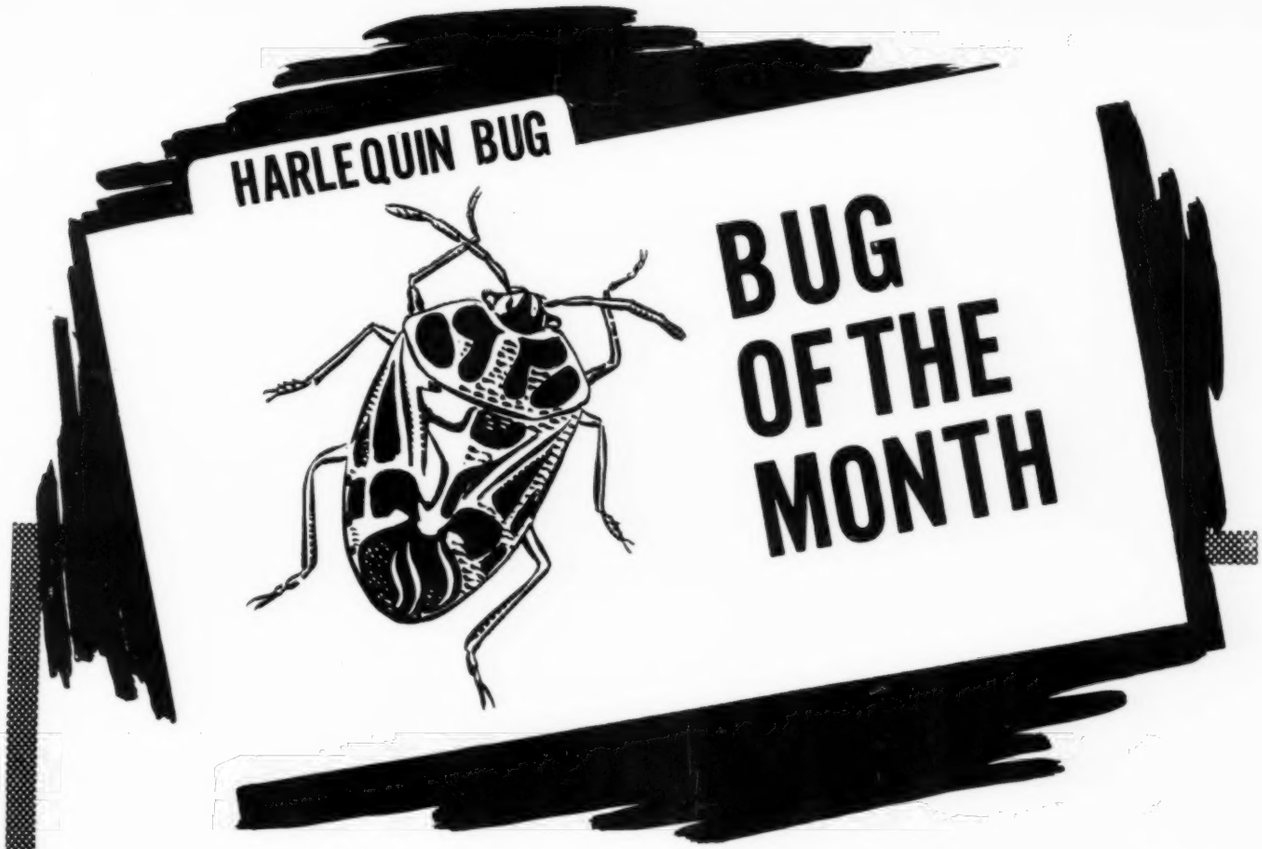
Late registrants at the A.A.E.E. convention at Richmond were popeyed in wonderment when, upon entering the spacious lobby of the John Marshall hotel, they met a horse walking out of the main dining room! Conjecture immediately began as to the meaning of all this . . . could it be that this refugee from the race track was a concession to the meat shortage, coming as he appeared to be from the hotel's kitchen? Steaks were eaten subsequently with greater relish when it was learned that the horse was not a potential hamburger supply, but rather an "educated" animal brought in to entertain a luncheon club at the hotel.



PRENTISS FOR PEST-TESTED *Basic Insecticides*

All indications point to the increased use of Sabadilla for the control of harlequin cabbage bugs, squash bugs, chinch bugs, *Lygus* and other plant bugs. Order your supply of Prentiss Sabadilla now with no worry about over-stocking for it has been proved that the insecticidal activity of sabadilla seed is actually enhanced by long storage.

Other Prentiss Basic Insecticides include:

1. Cube Powder, finely milled, uniformly batch mixed and tested.
2. Micro-Mesh Wettable—a 50% DDT powder formulated for agricultural sprays, and milled to an average particle size of 1.5 microns.
3. Micro-Mesh Dry—A 50% DDT powder for blending in agricultural dusts, also milled to an average particle size of 1.5 microns.
4. 25% Water-Miscible DDT Concentrate—Ideal for use where emulsions as sprays are indicated.
5. Pyrethrum Powder—A specific for many agricultural pests. Finely ground and adapted for agricultural dusts where Pyrethrum is necessary.

Plan now to use Prentiss Basic Agricultural raw materials and intermediate products in the production of your agricultural and livestock insecticides.

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D&O
ESTABLISHED 1798

ROTENONE

- The recent removal of price controls on Rotenone products and imports and the consequent impact on the South American arrangements on which supplies have depended have created new uncertainties.
- It is fortunate that imports during the past six months have been heavy and supplies in the hands of processors and insecticide manufacturers are at a higher level than in several years. These supplies, however, fall well short of potential demand though they might go far toward meeting minimum requirements.
- Further substantial amounts of root should be available from South America but the price has been forced up by speculative purchases or foreign bidding.
- It would appear that a situation again has been created which necessitates conservation of Rotenone for the most essential uses and intelligent restraint on the part of all factors responsible for its importation, processing, and distribution to avoid unnecessary or unreasonable price advances and speculative excesses.

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